GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

PROPRIETORS: WALTER KING, LIMITED. OFFICE: 11, BOLT COURT, FLEET ST., LONDON, E.C. 4.

Telephone: Central 6055. —— Telegrams: "GASKING, FLEET, LONDON."

VOL. CLXXX., No. 3367.] WEDNESDAY, NOVEMBER 30, 1927. [79TH YEAR.

Editorial Notes.

Reciprocal Interference—Parliament in Darkness.

THE electricity industry last week demonstrated to the Government and Parliament that it is very displeased with all they have innocently, but perhaps with honest intent, done for it, through passing the Act of 1926, and creating a condition of affairs from which few people believe benefits will flow. Those responsible for the electricity undertakings in London and the South-Eastern electricity area are up in arms against the scheme of the Electricity Commissioners; and this has been intensified by the intimation that the Central Electricity Board will not consent to an almost universal appeal for holding a public inquiry, but are willing to listen privately to representations. No less than 95 out of 102 undertakings in the area have registered protests against this attitude; and to-day they appear to be of opinion that what the Government have done for the industry is to set-up over it a despotic oligarchy from whose decisions there is no, or scanty, appeal. To speak plainly, it looks very much as though, in practice, there is little real division between the proceedings of the Electricity Commissioners and of the Central Electricity Board—that the constructive duties of the one and the judicial functions of the other have so rapidly intermingled that the theoretical intention of separate action has been practically blotted out. That is the feeling; and it has been activated by the Board's refusal of a public inquiry. Naturally, those concerned—those who have borne the burden of laying the foundations of the industry, and building it up so far—feel they are being ridden over roughshod; and this applies not only to electricity undertakings but to many industrialists, whom the scheme is supposed to be going to benefit, but whose belief is rapidly hardening that the contrary will be the effect. It is a great pity the Central Board should have antagonized so many at the very inception of their work; and greater is the pity that the Government should back-up the Board in their action by feebly replying to an appeal by Lord Gainford, in the House of Lords, that a public inquiry should be held (and who secured a motion for papers in a small House by 13 votes to 8), that they did not see that the Board could do more than had been done without incurring unnecessary delay. In other words, the Government prefer widespread discontent to a little delay for the consideration of representations which may be of material importance. Are the Electricity Commissioners and the Central Board afraid of public inquiry? It seems to be so.

The protest of Lord Gainford and other members of the House of Lords was made on Wednesday. On the following evening, electricity had its revenge on the Government by plunging both Houses of Parliament and a large part of Westminster into utter darkness, which caused a suspension of the sittings of our legislators. We do not defend the action of electricity. Its crude methods in this respect are only equalled by those of the socialistic section of our legislators, who use sound and not the withdrawal of light as a means for bringing about a suspension of the work of Parliament. Electricity showed on Thursday that it no more respects our legislative assembly than it does the humblest patron of its service. The Houses of Parliament, Government offices, Scotland Yard, Westminster Hospital, stores, shops, and business premises all suffered. One of the brightest sets of offices, and the envy of neighbours, in Victoria Street was that of the Society of British Gas Industries, which are gas lighted. The failure of the electric light came without any warning. There was consternation, debates in the two Houses collapsed, and then followed hilarity—in the Commons. Matches were struck, then the primitive candle was brought in, which was a thing that had never happened during the reign of gas in the two Chambers. But it was impossible to proceed with business, and Mr. Speaker left the chair. In the lobbies and corridors members, officials, and visitors were groping about. The failure (which is said to have been due to fire destroying a cable connecting the transformers to the switchgear at the Grove Road generating station) took place at 5.25; at 6.15, there were little bursts of brilliance, and again darkness. Just before 6.30, the lights reappeared, and with them Mr. Speaker. Simultaneously there was a failure of the Paddington supply. A surgeon at St. Mary's Hospital, in the borough, had just reached a delicate part in an operation, which had to be completed with the aid of the light of an acetylene lamp. There was a similar incident at Westminster Hospital, but in this case the operation had been nearly completed. However, it was a nasty trick for electricity to play upon the legislative assembly, whose members thought last year they were doing so much to rejuvenate it. We wonder whether the Prime Minister, with cherrywood pipe in mouth, during the reign of darkness, ruminated over the base ingratitude of his electrical protégé.

It was clear to many observers that trouble was sure to spring from the manner in which the Government entered upon the reorganization of the generation and distribution of electricity without consulting the industry itself, and by giving practically plenary powers to two bodies—who to all intents and purposes are one—to carry through schemes without (if they so determined) any adequate investigation jointly with the industry. Such interference with an established industry was undiplomatic. But it had not entered the minds of any of the (in this matter) critics of Parliament that electricity would so effectually demonstrate as it did on Thursday its ability to interfere with the usually august proceedings in the two Houses. Electricity, however, is not the gainer. Never has its inconstancy received such widespread advertisement.

Institute of Fuel and the President's Address.

THE Institute of Fuel made its début last week with its first annual conference and dinner, under the presidency of Sir Alfred Mond, Bart., LL.D., M.P. The spirited proceedings would have done credit to an organization much more advanced in life; and they were conducted with a membership composed of varied interests. This fact discloses that the objects of the organization are of an order which appeals to men concerned in the technical work of using in manufacture fuel to the best advantage. Men engaged in the coal, gas and coke, electricity, oil, and chemical industries were there, all attracted by the one quest—the more efficient utilization of our fuels, and a better co-ordination of their use than has hitherto obtained. This is not to say that fuel technology has been neglected; but it is felt that more unified procedure by collaboration will carry us along to fresh goals at a quicker pace. It may be useful to remark here that we should like to see the gas industry have a greater numerical representation in the membership. We are above all things a fuel industry—are users of raw coal and producers of refined fuel; and we should have, if not predominance, an equality with the at present best represented industry. With the President, we think the success and prosperity of the Institute are already assured. Anyway, that is the hope, because there is a vast amount of valuable work to be done; and the greater the impression that can be made upon it by co-operation, the better. To this end, a programme of work has been formulated on very practical lines.

It was pointed out by the President in his address that the establishing of the National Fuel and Power Committee (of which he is Chairman) testified to the recognition by the Government of the importance of the fuel problem to the country. There were previously doubts about this in view of the shadowy signs of such interest, and the fact that power and not heat took such a prominent place in the mind of the Government. We are pleased to see, in a reference to the investigations so far made by the Committee, the realization on the President's part of the necessity for reasonable legislation for the revision of restrictions in connection with the gas industry. It is remarked, too, that the President is in favour of "the least possible amount of official interference with industry in this country." With that there is distinct agreement; for in the gas industry in the past there has been such statutory tight-lacing that it was impossible to render the maximum public service, or to put into practice to the full the indications of science as to the ways to greater successes. Changes and experience have now shown other ways in which legislation needs loosening or revising, in order to enable the industry to perform a larger part in the work and requirements of the country. But while the President is in favour of "the least official interference in the work of industry" (interference never has had any genuine success where it went beyond the confines of safeguarding the public interests), we see that he suggests places where, in his opinion, it would be legitimate for the Government to intervene.

In dealing, for instance, with the position of the coal industry, Sir Alfred proclaims himself as in favour of a considerable further measure of amalgamation and rationalization. As we know, he has long been in favour of coal-selling organizations; and the creation of the South Wales Marketing Association is very much to his liking. He feels that the proposals which have been put into practice in the area could be largely extended under Government inspiration and direction. Government inspiration is one thing; the meaning intended to be attached to "direction" is ambiguous. During the war a great deal was learned as to one form of Government "direction" of the coal business; most people were not highly enamoured of it. However, Sir Alfred finds the position of the coal industry is so desperate that he feels it is the duty of the Government to adopt every possible measure to ensure action being taken for the revival of its prosperity. The want of prosperity, we should have thought, would be the best incentive to the industry itself. In another place, he speaks of the burden of heavy taxes and local rates upon industry, and how they increase the costs of production. This, in turn, causes unemployment, and so a heavier burden is thrown upon industries as ratepayers. This admittedly is a matter of national concern. Then there are railway rates. Despite Sir Alfred's aversion to Government interference, here again he says: "From the point of view of the responsibility of the "Government, I must point out that the whole question "of railway rates and allied questions is in the hands of "the Legislature. I would suggest that it is the duty "of the Government to intervene in questions of this "kind when companies—such as the railway companies—"operate under statutory authority." Sir Alfred's profession as to favouring the least possible official interference with industry does not appear altogether to square with his recommendations.

The President is strong upon the amalgamation of enterprises. He speaks from experience. He believes in the power consolidation gives, and in the progress that can be made by the ability to concentrate many competent brains upon research. He favours amalgamation of colliery interests; but he has large visions. Such amalgamations can lead to economies only if new capital is available to carry out improvements—such as the centralization of power stations, the installation of centralized cleaning and washing plants, centralized coke-ovens, and such-like technical improvements. This is all very well from the platform point of view, but there are dangers in mixing-up too much coal getting and preparation for the market with outside adventures. For example, centralization of power stations at the collieries is not a practical thing, unless huge and constant volumes of water are available there for condensing purposes. But we need not worry over that. The Electricity Commissioners and the Central Electricity Board are selecting the sites for new super-power stations; and they are not considering proximity of coalfields so much as suitability for distributing purposes. This reminds that perhaps it would also be better to take coal to coke-ovens situated near large centres of gas consumption and industrial coke requirement than to have to transmit gas under high pressure and to transport coke. The purchasers of gas from coke-ovens experienced during the miners' strike the inconveniences of the producing plant being situated close to collieries; and it is perfectly obvious to those who have followed the development of labour policy the last few years that it is better not to mass at the collieries the heating and power energy production for the country. Neither is it wise, with aerial developments, for these things to be too concentrated in times of war. We must look forward, as well as to the present.

The President is behind the scenes in many matters; and he foreshadows the coming of a new process for the removal of ash from coal which offers "very considerable possibilities." He refers to the large quantity of sulphur contained in the mineral matter associated with coal, which is removable. The process is capable of dealing with many classes of coal, and reducing the ash content below 2 p.ct. A commercial plant is nearing completion at a colliery with which Sir Alfred is identified, and will soon begin practical operations. Such a large user of coal as the gas industry would be pleased to have deliveries containing below 2 p.ct. of ash; and, as the process is enveloped in "considerable possibilities," the industry will hope that this means that ash removal will become a profitable occupation for collieries, and not an addition to the cost of the coal.

Manchester Institution Address.

THE members of the Manchester Institution of Gas Engineers visited Leeds last week, where their President (Mr. C. S. Shapley) is responsible for the engineering and executive management of the Corporation Gas Department. This is his second consecutive year in the Presidential Chair; and, while he is full of appreciation of the honour his colleagues did him in inviting him to continue in office, stress of work would not allow him the opportunity to prepare a second Presidential Address of composition and measure which appear, for some unknown reason, to be regarded as conventional or imposed by duty.

Instead, he gave the members a few interesting jottings on past experiences, current requirement, and prospects.

Much has happened since the members of the Institution collectively visited Leeds six years ago. Among the events have been the great coal stoppage, and the passing of the Government electricity scheme. The first produced unusual experiences; the latter, in its possible effects, is an indefinite quantity in our vision of coming conditions. Nevertheless, as increased business is essential to the success of the electricity scheme, it behoves us to prepare for anything which may emerge from the new state of our competitors. Dealing with the coal stoppage, the President refers to the question of the best calorific value to supply to consumers. He says "it would be interesting to know how many undertakings who have adopted the Gas Regulation Act have since wondered whether the quality they declared would be the same had they known what the stoppage taught them, and how many have altered their declared value as a direct result." We think it may at once be replied, "Not a great many;" for the simple reason that there have not been a great number of applications for change during the current year, and those that have been made may not be a direct result of the coal stoppage. What is to us astonishing is that, during the period of the stoppage, with all its difficulties and anxieties, such a large percentage of the gas supplied in Great Britain was preserved in calorific value at or above the declared, concerning which fact we have had such eloquent assurance from Mr. W. J. A. Butterfield, one of the Gas Referees, in his address as Chairman of the London Section of the Society of Chemical Industry. We agree with the President as to the inestimable value of water-gas plant in times of emergency; no greater testimony could have been given of this than was supplied during the stoppage. But there will be some engineers who will probe very critically Mr. Shapley's statement that, "in the last coal stoppage alone, our carburetted water-gas plant more than paid its total cost, inasmuch as its capital value is £74,000, and, had not the plant been available, 47,000 tons more coal would have had to be purchased at a cost (after allowing for increased income from residuals) of £74,650 over contract price. The whole of this would have been reflected in the price charged to the consumers." Such figures are subject to modification; inasmuch as the water-gas plant required then very valuable coke and oil. However, this is only a question of statement, and not a reflection on the value of the water-gas plant, which saved the purchase of 47,000 tons of coal in times when the world beyond our shores was being drawn upon under great pressure for supplies, and unprecedented difficulties in that regard had to be fought and overcome. Reverting to the subject of calorific value, the President's experience is that, for Leeds, a gas of 470 B.Th.U. is right, given constant pressure; and the test he applies is the ratio of complaints to consumers. Complaints only average 73 a day with 125,000 consumers—that is, 1 : 1712—including stuck pennies, full money boxes, unsteady lights, burner adjustments, &c., those minor things which are important to the consumer, and must not be neglected, but are small compared with the magnitude of the business.

It is true, as the President states, we are the poorer through the coal stoppage. But that is financially through the cost and losses, and industrially owing to the wasted trade. In other respects, however, we submit there has been enrichment. The gas industry gained fresh laurels for what it did, but above that the stoppage demonstrated the loyalty of our men with relatively few exceptions. It has also created a change for the better in the point of view and in the activities of the responsible trade union leaders, who are utterly sick of the disturbing tactics of the Communists and Reds, and will not tolerate their interference in trade union management. The stoppage has revealed the truth of a grave drift, which was leading no one knows where. To that extent out of the stoppage we believe good has come for the future of this country.

The President had several excellent things to say, and timely advice to give, on the subject of the coming competition, and the inestimable value of service (including maintenance) in protecting our interests. It is clear that Mr. Shapley is out for larger operations in this direction, and is strong enough to feel that the fraction per therm of expense placed upon the price of gas has its compensations to both undertakings and consumers—extended business and efficient use of the primary commodity have their economic results. To contend otherwise, only shows an incapacity for penetration beneath the surface. As to what Leeds is doing, when we read that plans have been approved for the spending of upwards of £100,000 for a new distribution department and workshops, it is enough.

Gas-Heating Successes and Prospects.

THE course of events and the logic of facts give to the gas industry a high place in the air purification campaign. Smoke abatement is becoming a more popular subject, and particularly as it appeals on the grounds of health and greater availability of sunlight. The industry is already the largest purveyor of smokeless fuel, because it has the best commodities. No other industry can compare with it; and its service in this regard are of national importance. The paper which Mr. F. W. Goodenough presented to the Public Works, Roads, and Transport Congress recently, and which we published a fortnight ago, causes one to ponder over this matter, and to suggest to the industry that the smoke abatement movement should be strenuously backed by it, not only for its own advantage, but for that of the communities it serves. There is that 40 million tons of coal or thereabouts still used in domestic service upon which to concentrate, and the nearly 50 million tons of raw coal consumed in industry to which attention must be given. These figures present large scope for business expansion and national service.

Data are supplied by Mr. Goodenough which show how the gas industry merits the confidence of the country. If it had not been for the work of the industry, and coal was still employed for all the heating purposes now accomplished by gas and coke, the soot statistics would be far more serious than they are. But the reduction of the fall of soot in (for example) the London area is, of course, attributable not only to the consumption of gas and coke for domestic heating, but to other reasons. Gas undertakings do not want to take more credit than is justified, though they like to have credit for what has been achieved by them, and can yet be done. The position is worth examination. The trend of events has brought about a reduction of the density of population in some of our large cities and towns by the migration of people farther afield. We do not know that this, from a gas undertaking's point of view, is altogether a good thing; but there is no question that it is excellent from the standpoint of general health. To it is attributable the spreading of emitted smoke over a larger area. Another consideration is that coal stoves and grates have been improved to the end that, by the newer types, better combustion is secured. The paper also reminds us that the ash content of domestic coal has increased by something like 15 p.ct., as compared with the percentage before the war. That, too, is a subscribing factor to the diminution of smoke per ton of material bought as coal, and charged into domestic fires. Then the gas cooker has largely dispensed with the service of the kitchen coal range, which was a bad offender in respect of smoke production; and there are the large advances which have been made in room heating by gas, and in hot water supply by both gas and coke. It is remarkable how consistently, as Mr. Goodenough points out, the gas industry has added to its average annual rate of increase in consumption since 1884—that is, if we except the comparatively small set-back during the war years and those immediately succeeding. The figures will be found in the paper; but we will quote the average annual rate of increase which applies to the ten years 1914-24 (4940 million c.ft.), in order to accentuate the astonishing fact which official data disclose, that the average annual rate of increase during the past three years has been no less than 11,000 million c.ft.

We have much to be thankful for; but that must not lead to any "rest-and-be-thankful" spirit or policy. We are told by the paper that in our cities and towns, and wherever a supply of gas is available, something like 90 p.ct. of the population have their food cooked by gas.

That is getting close to saturation point, but our successes in cooking have excited the envy of the electrical people, who look with envy on this day-by-day load, and would like to enter into the enjoyment of it. This being so, the work of the gas industry must not be directed solely to obtaining a 100 p.ct. figure for cooking by gas; there must be care to defend the 90 p.ct. cooking load. The fact of possession is not enough. Possession has to be protected—in one way by putting cookers into good condition, and applying, as opportunity allows, means for realizing modern efficiency on the hotplate. Fast as the heating of water by gas or coke is growing, there is a big field for business in that line; and while 40 million tons of coal has continued existence in domestic service, there is a wonderful amount of work to be tackled in the direction of room heating, which cannot, owing not only to cost, but to the erratic incidence of demand, be well dealt with by the electricity industry. For it to do what the gas industry is doing would be to insert into their operations something which would have a big crippling effect economically. A figure which is particularly interesting in this connection is that no less than 1½ million gas-fires are on hire in the British Isles, apart from the large numbers which are the private property of householders; and the rate of connection is mounting-up in a remarkable way. It is interesting to observe that this progress has been made with the therm at a higher price than will obtain if things continue to go well. Prices for gas are being reduced pretty generally throughout the country; and every conceivable means must be adopted, through the agency of reasonable economy and maximum efficiencies, to realize cheaper gaseous therms, and so get gas heating established where it has not yet found a place, and extended where it has already been tried. Well-maintained gas-fires and the two-part tariff are methods which will subscribe enormously to advance in this relation. What Mr. Goodenough had to say regarding gas price being an obstacle to a still greater rate of progress was well put, and requires to be studied to be fully appreciated.

There are an enormous number of facts in the paper which could be usefully applied for enlightening the public. Prejudice against gas heating has to a very large extent been overcome by education and experience; and the advantage which has already been secured by the industry and the country through the beneficial effects of gas heating, requires to be pushed home by such well-substantiated facts as are so generously presented in this contribution. All Mr. Goodenough says in it shows that the prospects for the gas and coke business, in both domestic and industrial service, are highly promising. "I look upon the prospect," he said, "of an almost smokeless Britain with real, and, I believe, well-founded optimism." The harder the gas industry works to this end, the greater can be the agreement with the optimistic view.

Coal Selling Organizations.

As we expected would be the case, the South Wales scheme for the regulation of coal prices (to which reference was made last week) is attracting considerable attention in other coal areas. Reports from the Yorkshire area tell us that the trend of opinion there is towards some system of co-ordination. It is, however, believed that no such scheme can be worked out except by large-scale organization with extensive resources, and particularly is this so in respect of export business. A somewhat similar scheme to that about to operate in South Wales has been under discussion during the year in Yorkshire; and this is not the first occasion. Some time ago the colliery owners were in consultation with their neighbours in Nottinghamshire and Derbyshire on the question of preventing further depression in prices; but regulation of output was then the rock on which the suggestion shattered. One view in Yorkshire is diametrically opposed to a condition in the South Wales Marketing Association's scheme. Under this, there is to be no restriction or allocation of output. We imagine that limitation of output would mean increased cost of production. But Yorkshire coal interests maintain that control of price by itself is inadequate for the purpose in view. They have an illustration. In West Yorkshire an amalgamation of collieries was made not many months ago for regulating sales; but, with the world's surplus of output, their prices have had to follow the general trend. It has been proved that coal prices cannot be dealt with piecemeal. There are two conditions essential to the success of any price scheme: Unity in an extensive area; and control of output. That is an outlook large buyers will not contemplate with equanimity. The coal industry has a tough problem before it.

Gasholder Accident at Manchester.

The Home Secretary has decided to direct that a public inquiry shall be held into the explosion at the Bradford Road (Manchester) Gas-Works, in which two gasholders were involved. The inquiry is to be held under section 22 of the Factory Act.

Irritant to Prevent Suicide.

Giving evidence in a case of suicide by gas at Wallasey (Liverpool), Dr. Walter Stansfield suggested that some irritant should be introduced into coal gas, which would stop people from using it for suicidal purposes. People are not deterred by the knowledge of pain from jumping into rivers or before trains if they have resolved to end their lives.

Pittsburg Gasholder Disaster.

It is announced that the Equitable Gas Company will meet all justifiable claims arising from the damage caused by the gasholder disaster. These, it is stated, are provisionally assessed at 1 million sterling. The death roll is placed at 28; the injured are said to have exceeded 600, of whom less than 100 had to be detained in the hospitals. Some photographic reproductions of the wreckage resulting from the explosion appear on later pages.

"Gas Salesman" Supplement.

The "Gas Salesman" Supplement to this issue of the "Journal" contains a review of the paper by Mr. F. W. Goodenough before the Public Works, Roads, and Transport Congress. From it data of value to gas salesmen have been extracted. Another instalment of "Elementary Treatise on Gas Lighting" is published, together with reports of Circle meetings and miscellaneous articles and information.

Science and Industry.

Prof. Sir J. J. Thomson, O.M., F.R.S., has been warning industry on its attitude to science. The occasion was the opening of the new laboratories at the Leys School, Cambridge. Sir Joseph has nothing whatever of which to complain concerning the position of science in the majority of English schools; but he is not altogether satisfied with the progress of the change in attitude of industry to science. "You cannot run an industry of to-day on the science of yesterday," he said; "and the closest correlation between science and industry is essential. There is no work more difficult than to steer a great industry successfully; and if its leaders rest on their oars, the progress of science will wash them on to the rocks." The attitude of many leaders of industry is "not altogether satisfactory." The majority of them seem content to "carry on" in the same way that their fathers did, wondering why their profits are less than their fathers', but forgetting that their predecessors had themselves been progressive and inventive, and that no industry could be expected to run "on the impulse of its inertia." This spirit must be got rid of.

The Overmanned Coal Industry.

While much is publicly made of the number of unemployed in the coal industry, the Executive of the Miners' Federation know full well that the industry is overmanned. Probably it was not intended that a passage from the report of the Executive for June last should see the light of day; but it has. It is as follows: "It is a matter of common knowledge within our Federation that during the war, and during the years which followed the war, many persons found employment in the coal-mining industry who had previously followed other callings,

and the advent of such persons into the industry had the effect of curtailing employment for many *bona-fide* colliery workers who really belonged to the industry and were members of our organization. It is the view of many members of the Federation that the influx of such persons has also reduced the efficiency of the industry; but whether that is so or not, it became transparently clear of late years that the industry was overmanned, and that it was essential in the interests of our own members to restrict the entry of further persons into the industry. This was a matter in which the Federation was very reluctant to move."

Trade Union Membership.

The membership of trade unions in Great Britain and Northern Ireland at the end of 1926 was less by 5 p.ct. than it was at the beginning of that year. The organizations in respect of which statistics are published number 1129, and at the end of last year their members totalled 5,208,398. The 1925 aggregate was 5,496,622, which was 5·2 p.ct. greater. Compared with pre-war days, there were roughly a million more trade unionists in 1926; but in comparison with 1920, 3 million fewer.

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Dec. 3.—SCOTTISH JUNIOR GAS ASSOCIATION (WESTERN DISTRICT).—Meeting in the Royal Technical College, Glasgow. Paper by Mr. J. Boyle, of Greenock, on "The Manufacture of Pure Liquid Ammonia." Mr. D. Melvin, of Uddingston, will read his thesis which gained the Diploma of the Institution of Gas Engineers.

Dec. 3.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Porth. Visit to the Miners' Rescue Station, Dinas. Paper by Mr. T. Noall on "Co-Partnership."

Dec. 3.—WESTERN JUNIOR GAS ASSOCIATION.—Visit to the Stapleton Road Works, the Canon's Marsh Works, and the Barton Street Stove and Meter Workshops of the Bristol Gas Company.

Dec. 3.—NORTH OF ENGLAND GAS MANAGERS' ASSOCIATION.—Half-yearly auxiliary meeting in Sunderland.

Dec. 6.—BRITISH COMMERCIAL GAS ASSOCIATION.—West Riding of Yorkshire District Committee, at Leeds.

Dec. 7.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Cyclops Tube Works of Messrs. Le Bas Tube Company, at Millwall.

Dec. 7.—MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Ship Canal Portland Cement Manufacturers, Ltd., Ellesmere Port. Paper on "Portland Cement and its Uses," by Mr. H. J. Gillett (Chief Chemist).

Dec. 8.—BRITISH COMMERCIAL GAS ASSOCIATION.—Midland District Committee, at Birmingham.

Dec. 10.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to the Granton Gas-Works, Edinburgh.

Dec. 13.—NATIONAL GAS COUNCIL.—Meeting.

Dec. 13.—FEDERATION OF GAS EMPLOYERS.—Meeting.

Dec. 15.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting at the Council House, Birmingham. Paper by Mr. J. S. Hayward (Industrial Heating Section, Birmingham) on "The Heat Insulation of Materials."

Dec. 16.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute, 7.30. Paper by Mr. J. M. Loughland on "Gas-Fired Fish-Frying Ranges."

Dec. 17.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Brighouse. Paper by Mr. W. E. Stephenson, of South Bank, on "Incidentals in the Manufacture of 400 c.v. Gas." Inspection of the works.

INSTITUTION OF GAS ENGINEERS.

Dec. 12.—Emergency Committee.
Finance Committee.
Dec. 13.—Education Committee.

"S.B.G.I." Golf Circle.

The Circle held their Autumn Meeting at Sundridge Park on Friday, Nov. 18, when the "Victory" Cup presented by Mr. H. M. Thornton was competed for by Medal play. The winning card was returned in the morning by Mr. E. J. Davison. In the afternoon foursome matches took place; the winners being Mr. E. Cutler and Mr. E. J. Davison.

PERSONAL.

Mr. JOSEPH WILLIAM NELSON, of Startforth, has been appointed Manager of the Staindrop Gas Company, Durham. He was formerly with the Annfield Plain and District Company.

At the last Associate Membership Examination of the Institution of Chemical Engineers, held in June and July of this year, Messrs. HAROLD HUNTER, EDWARD WALLIS, and EDWARD WILLIAM WIGG satisfied the Examiners.

Councillors DICKINSON and CLARK have been elected Chairman and Vice-Chairman respectively of the Rotherham Gas Committee.

Alderman G. CLARK has been elected Chairman of the Chesterfield Gas Committee, and Council A. SWALE Vice-Chairman.

OBITUARY.

Sir ARTHUR FRANCIS PEASE, of Middleton Tyas, near Darlington, was seized with illness last Wednesday while attending a meeting at Darlington, and died soon after being taken home. He was 61 years of age. After leaving Cambridge, he received a thorough business training in the head office of Pease & Partners, Ltd., at Darlington, shortly afterwards joining the Board and ultimately becoming Chairman and Managing Director. Latterly, however, owing to failing health he had given up the Chairmanship. He was a Director of the National Benzole Company and other concerns, and possessed, of course, an intimate knowledge of all questions connected with the coal trade.

It is with great regret that we have to record the death, due to hæmorrhage of the brain, of Mr. HERBERT BLYTH, which occurred at his home in Bristol, on Nov. 15. Mr. Blyth was a director of Messrs. Strachan & Henshaw, Ltd., of Bristol, and was Manager of their mechanical handling department, a position he had held since 1910. He was well-known throughout the gas and electrical industries, and played a leading part in the introduction of electric telpherage into gas-works and electricity stations, for the handling of coal and coke. He received his early engineering training at the Great Western Railway Works, Swindon, and was afterwards engaged in the drawing offices of Messrs. Herbert Morris, Siemens Brothers, & Royce, Ltd., of Manchester. In 1910 he was elected an Associate Member of the Institution of Civil Engineers, and was transferred to full membership in 1920. Mr. Blyth leaves a wife and son, to whom deepest sympathy is extended.

THE EVENING STAR LODGE, No. 1719.

The Worshipful Master, W.Bro. Frederick G. Cockey, occupied the chair on Wednesday last at the regular meeting of the Evening Star Lodge, which was held at Freemasons' Hall, Great Queen Street, London. The S.W., W.Bro. Arthur L. Croager, and the J.W., W.Bro. James W. Foreman, were in their respective places.

After the usual opening proceedings, Bro. J. H. Goldsmith and Bro. L. R. Fender were each conducted to the degree of M.M.; and subsequently Bro. Harold T. Abady and Bro. Robert Grant were promoted a degree. During the latter ceremonies the I.P.M., W.Bro. Alfred H. Henry, officiated in the chair.

On the ballot being proceeded with for the office of W.M. for the year 1928-29, the S.W., W.Bro. Arthur L. Croager, was declared to have been unanimously elected. As Treasurer for that year W.Bro. Arthur E. Croager, P.M., P.P.G.D., Kent (the present occupant of the office), was unanimously elected.

In recognition of his services as W.M. of the lodge during his year of office (in which incidentally its jubilee had been so successfully celebrated), it was resolved that arrangements be made for the presentation of a P.M.'s jewel to W.Bro. Cockey on the occasion of his relinquishing the chair.

The W.M. was appointed as steward to represent the lodge at the forthcoming festival of the Royal Masonic Benevolent Institution; and a contribution was voted for placing on his list.

It was announced that the congratulations of the brethren had been conveyed to W.Bro. Jacques Abady, L.R., a P.M. of the lodge, on his election as Mayor of Westminster. His letter acknowledging the compliment was read.

The brethren afterwards repaired to the adjoining Connaught Rooms for dinner, W.Bro. Cockey presiding. During the course of the evening each toast in the usual official list was cordially received; and an excellent musical programme was rendered. The toast of "The Visiting Brethren," which was proposed by W.Bro. Abady, was acknowledged by W.Bro. F. M. Potter, W.M. of the Imperial College Lodge, No. 4536; Bro. C. Hill Ludlam, of the Oxford Lodge, No. 85 (Sydney), of the United Grand Lodge of New South Wales; and Bro. W. Jepson, of the Carbon Lodge, No. 2910. To the toast of "The Past Masters and Officers," given by W.Bro. C. J. Chree, P.G.Swd.B., Middlesex, response was made by W.Bro. Alfred C. Beal, P.M., and Bro. Thomas F. C. Potterton, I.G.

ELECTRICITY SUPPLY MEMORANDA.

THE decisions of the Electricity Commissioners and the expected ones of the Central Electricity Board are causing much unhappiness among the present electricity supply authorities in what is known as the South-Eastern area, which constitutes the second scheme under the 1926 Act. The London and Home Counties Joint Electricity Authority are anything but pleased with the plans of the Commissioners. They have had Committees investigating the matter; and they do not like the intention of the Commissioners to sanction the erection of the new generating station at Battersea by the London Power Company, Ltd., in advance of the erection of the station at Chiswick by the Joint Authority, "the need for the immediate erection of which has never hitherto been questioned by any competent authority." This, of course, is not meant to suggest that the Electricity Commissioners or the Central Board are not "competent" authorities; but it is submitted that the scheme reveals no reason why the erection of the Chiswick station should be postponed. However, the Joint Authority have to take conditions as they exist under the 1926 enactment. Therefore they propose that the authority should either be placed in the position of purchasing supplies from the Central Board on base-load selected station terms, or that they should be permitted to proceed with the Chiswick station without delay. They also submit that the methods for bearing the cost of the transmission system to be constructed and operated by them should be altered, as their effect would be to place undue burden upon those authorized distributors who take supplies from the Central Board through the Authority. Further, in framing charges due regard, they contend, should be paid to the load factor and the power factor of the supply. Then regarding the suggestion that the capital cost of the transmission system to be constructed by the Authority should be borne by them, they have asked the Central Board to consider the advisability of the necessary financial arrangements being carried out as part of the capital expenditure of the Board. On this and the other points, negotiations, it is understood, are proceeding between the Authority and the Board. Meantime, the Electricity Commissioners have approved the construction of the Battersea Station.

Unhappy Authorities.

Hedging.

The enormous figures which have been published from time to time regarding the estimated costs of the various imposing items in the schemes so far submitted for consideration are giving the gravest concern to electricity suppliers. With little pause, information is published which lays blame for heavy costs upon the conditions prevailing in this country, particularly with respect to transmission line work. If the schemes do not have financial issue exactly as pre-ordained, then those who have been responsible for them will be able to say: "I told you so. But it is not our fault; it is that of the conditions." The public have, for instance, been pretty well saturated with the intelligence that in this country overhead electric lines cost from £600 to £800 per mile, as compared with £150 to £250 per mile on the Continent. These figures are getting stale and mildewed, and probably later on it will be divulged (as was the case with the early statements as to the *per capita* consumption of electricity in this and other countries) that the facts are not precisely as stated. We can well imagine, for instance, that on the Continent the £150 to £250 per mile may be the cost after deducting the heavy subsidy paid in some countries by the Governments in support of electrical generation and transmission. We do not say this is so, but it may be so—we have had former statements as to the ability of certain water-power countries to supply electricity at a low average price per unit, and then learned that substantial subsidies (which the ratepayers have to pay) contribute to this end. Sir Philip Dawson, in a letter to "The Times," reiterates the comparative charges for overhead lines referred to above. He also points out that the electricity scheme is burdened by the rules and regulations which the Electricity Commissioners have issued under the 1926 Act. These set forth the requirements of the Post Office, railways, canals, road authorities, local authorities, &c., which impose onerous conditions in regard to construction. Such requirements obtain in no other civilized country; and they involve, according to Sir Philip, unnecessary expenditure and delay. In his view, unless they are materially modified, the progress of the Central Electricity Board will be greatly hampered. He also indicates that, if the necessary alterations cannot be carried out administratively, then further legislation will be required, for to him it is inconceivable that, having created a Central Electricity Board to bring about a cheap universal supply of electricity, Government Departments, railway companies, local authorities, or other vested interests should have it in their power to prevent or to retard the objects for which the 1926 Act was passed. All of this bears upon conditions which were well known to exist at the time the Act was passed; and the repeated publicity given to the matter appears to signify a desire on the part of those concerned to make an early impression on the public mind that the first prognostications as to electricity being supplied throughout the country at "next to nothing" will not mature, owing to the retarding conditions over which the Commissioners and the Board have no control.

Luton Speaks Its Mind.

Luton is the home of many important industrial firms. We know George Kent, Ltd., Vauxhall Motors, Electrolux, Ltd., Commercial Cars, Ltd., The Davis Gas-Stove Company, Ltd., and there are many others. Luton thrives; and contentment with local gas and electricity conditions prevails. The industrialists feel that the Town Council have served them well in respect of their requirements for electrical energy; and they are persuaded that the known conditions, with their perfectly good possibilities, ought not to be disturbed by a speculative big project which political influence, and not economic justification, is bringing into being. The Luton Council have registered their protest against the South-Eastern scheme; and, in public meeting, the industrialists have supported them. There was something autocratic in the way the Government forced the scheme on the electricity industry and the industrial community, on grounds which, the more they are examined, the more they are soaked with well-merited ridicule. Luton's electricity station is to be gradually closed down, and the current is to be taken from the Little Barford station, the only part of which existing at present is the site. Analyzing the position with the most scrupulous care, the Luton Town Council and their large consumers of electricity for industrial purposes see nothing for them in the scheme, except a higher price and greater unreliability; for the network of mains (which political theory says will give greater constancy) is regarded as the seat of greater potential interruption than home generation. Moreover, it is believed that, if Luton was left alone, the present reasonable prices would be lessened progressively as demand develops. What Luton thinks, many other towns are thinking; and so the Government scheme is being developed amid much unfriendliness.

Supposed Causes and Anticipated Effects.

Certain things were said at the meeting of Luton industrialists which show they have righteous ground for protest. The average price of electricity in the town in 1926 was 1·02d. per unit. Of the three companies which are to predominate in the South-Eastern scheme, one has not yet erected its station. The two in existence had in 1926 average prices of 2·8d. and 1·44d.—152 and 44 p.ct. higher than the Luton average charge. It is anticipated that, by 1933-34, Luton will require 45 million units; but their own station is only to be allowed to produce 3,700,000 units, and the balance of 42 millions is to be bought from the Little Barford station at a higher rate. But, of course, the Luton station could as demand increases be developed to supply its own requirements, were it not for this scheme. Further information was supplied by many speakers—the Electrical Engineer (Mr. W. H. Cooke) among them. From his remarks, it is gathered that at Bedford there has been an expression of strong resentment over the fact that a member of the Central Electricity Board is the Chairman of one of the Supply Companies, and has an interest in others. We take it that this reference is to the Chairman of the North Metropolitan Electricity Supply Company, Ltd., who is a member of the Central Board. Mr. Cooke stated that this Company have twice attempted by Bill to annex the Luton area, but failed on both occasions; and now they are practically being given the area by the scheme. In his opinion, it is absurd to suppose that in the area round Little Barford there can be developed such a demand as the forecast suggests. Those who know that area are aware there is nothing there which justifies the estimates. Farmers have not the money to carry on their farms, much less to electrify them. In Mr. Cooke's view, the station at Little Barford is designed for no other purpose than to get the Luton and Bedford loads. And so it came about that the meeting of industrialists approved of the representations made by the Luton Council to the Central Electricity Board. It was also urged that effect should be given to the proposals of the Council, as it is of vital importance to the local industries that they should continue to have a cheap and abundant supply of electricity, which is assured under present conditions, but uncertain in the circumstances of the scheme. A public inquiry into the whole matter is being sought. However, if industrialists find that under the scheme their position will be worsened, it will give a splendid impetus to the adoption of private generating plants.

An All-Electric Ideal.

West Ham is growing more and more ambitious—electrically. Moved by their enterprising Engineer, the Electricity Committee recently recommended (and the Council agreed) that the Finance Committee should consider the provision of funds for creating an all-electric West Ham. It is estimated that the cost of laying the electric mains in the streets would be

£280,000, entailing an annual charge, at 7½ p.cent., of £21,000 per annum, which, of course, does not constitute the whole of the charges involved by an electricity distribution system. But to make the borough "all-electric," it is necessary to get all the householders, factory owners, and business people of the same mind as the Electrical Engineer, and that is a more colossal task than laying an electricity distribution system. Without their help, the expenditure of £280,000 and all else that it embraces might prove to be a white elephant for West Ham, the population of which is not comprised of millionaires. By the way, we notice the remaining street gas lamps are to go.

Stand-by Diesels. In some of the small electricity stations, Diesel heavy oil engines are used exclusively for generating purposes; in certain of the larger ones they are employed for stand-by, peak-load, or low-load purposes. A few days ago a new generating plant, driven by what is described as the largest stationary type of Diesel yet installed in an electricity supply station in this country, was inaugurated at the Short's Gardens, Drury Lane, works of the Charing Cross Electricity Supply Company. The B.H.P. of the engine is 1750; and it is said to show a marked economy in fuel. It was supplied by the General Electric Company; and Sir Hugo Hirst, Bart., stated that the plant is capable of exceeding any in this country by 50 p.ct. We presume this means in point of oil efficiency. Sir Hugo considers, in addition to stand-by use, such plants will be valuable in countries where coal is scarce or non-existent, and strike troubles are likely to interfere. The information was given by Mr. A. H. Dykes that Berlin is putting down a pair of 8000 kilowatt sets merely for dealing with peak loads. This Engineer recommends the Diesel for installation instead of super-power stations. He unkindly reminds of war and air raids, and tells us that the big super-stations cannot fail to be hit from the air in time of war. Diesels have all sorts of recommendations in comparison. They can be installed 20 ft. below ground, save transmission lines, defy attacks, prevent our power resources from being shut down, and so can keep our fundamental services going. This is all very well; the electro-political experts of the country do not appear to have specially included Diesels in their super-station plans. They prefer big stations, and vast transmission lines; and all else—even contingencies such as Mr. Dykes dwells upon—can go.

Electric Week. The week that is to be sacred to electric propaganda on a "national" scale, or rather so far towards being "national" as electrical people will permit it to be, is, as previously announced, Dec. 3 to 10. But considering the size of the country, the number of cities and towns in it, and the thousands of electrical contractors who seek to get a living out of the electricity business, 500 is not a large number of contractors and undertakings combined. To tell the simple truth (which the electrical papers are not doing) the effort to raise universal enthusiasm for another six months' campaign has fallen flat—and patchy. Some newspapers have promised to publish electrical articles during "the" week; they no doubt expect a *quid pro quo* in the shape of advertisements. We read, too, that the Shropshire, Worcestershire, and Staffordshire Electric Power Company have erected a number of hoardings, in various parts of their area, which bear the slogan: "For Health's Sake, Use Electricity." People, of course, wink their eyes at this sort of thing, and smile broadly. They are getting accustomed to the very best of things being said for electricity; they know from personal experience, or the experience of others, which gets broadcasted, that there are sufficiently good reasons why they will do well not to use electricity for all the recommended purposes. They have even been known to give gas people information as to their dismal experiences.

Mishaps—Parliament in Darkness. An inquest was held at Bethnal Green on Monday last week on a woman who died from burns, owing to her clothes catching fire at an electric radiator used at a factory where she was a cleaner. A verdict of "Accidental death" was returned. Guests at the Norbreck Hydro, near Blackpool, were awakened at two o'clock on the morning of Nov. 20. Fumes and a strong smell of burning rubber greeted them. It was caused by a fusion in the electrical control room on the ground floor, which set fire to a portion of a cable and fittings. The flames were speedily extinguished by the Fire Brigade. On the 18th inst., the electric light failed in the Sheffield Coroner's Court. An inquest was being held; and an electric flash lamp and two candles did duty for the erring electric light. But the biggest, and most advertised, misadventure of the week was the one at Westminster on Thursday (referred to in our editorial columns) which involved the Houses of Parliament, interrupted the sittings, affected Scotland Yard, Westminster Hospital, stores, shops, business premises, and the offices of professional men. This carried the message of inconstancy where it was least desired it should go. The dignity of Parliament was reduced to the level of candle light, hilarity, and suspension, which were conditions unknown, for similar cause, in the days of gas lighting. The same day collapses occurred at Paddington and Hull. At a hospital in the former borough, an operation had reached a delicate point when the light failed, and an acetylene lamp had to be requisitioned. During the dense fog on Wednesday, the current in Fulham for a few minutes failed to function.

INSTITUTE OF FUEL.

FIRST ANNUAL MEETING.

A two days' conference of the Institute of Fuel was opened at the Institution of Electrical Engineers, Victoria Embankment, London, on Wednesday, Nov. 23, under the Presidency of Sir ALFRED MOND, Bart., M.P., who at the opening delivered his address. A number of papers were submitted, of which those more closely touching upon the gas industry's work will receive notice in subsequent issues of the "JOURNAL."

PRESIDENTIAL ADDRESS.

Sir Alfred Mond, after referring to the amalgamation of the Institute of Fuel Technology and the Institute of Fuel Economy Engineers, said it was with regret that he had to announce that Sir William Larke, owing to the many duties involved in his position with the National Federation of Iron and Steel Manufacturers, had been compelled to resign the Chairmanship of the Council of the Institute. It was always difficult to find a successor to Sir William Larke in any job, but a successor had been secured who would be received with general acclamation—namely, Mr. Frank Hodges, who knew the fuel problem from every possible angle. He had had the pleasure of working with Mr. Hodges as his Vice-Chairman on the Government Fuel Committee; and a more charming or energetic man he had yet to meet.

MEMBERSHIP.

Speaking of the Institute itself, he was pleased to announce that the membership showed an increase over the combined membership of the two original Institutions; but it was not desired to stand still, and therefore he urged that all should do their best to secure new members. A class of "collective members" had been established; and already some of the most progressive and largest firms in the country had joined. The object of increasing the "collective membership" class was to enable the subscription to be maintained at its present low level to the ordinary members. Every constituent firm of Imperial Chemical Industries, Ltd., was a "collective member" of the Institute.

Regulations were being drawn-up in no narrow professional spirit governing the membership, which it was intended to maintain at as high a standard as possible. Monthly meetings had been arranged in London, and would be extended to the Provinces; and at the present time it was intended to issue a quarterly journal, to be followed later by a monthly journal, which would contain a bibliography of the fuel literature of the world. He also expressed the hope that the Institute would develop the advisory side of its work, and become a more or less authoritative body for those who were endeavouring to obtain help in fuel problems, and who had not the technical assistance at hand which was at the disposal of the larger companies and institutions. It was a melancholy fact that, after all these years of dealing with fuel problems in this country, we were still in a relatively backward and crude position. While in some instances the most advanced and modern ideas were in operation, in others the most crude, wasteful, and primitive practice in the use of fuel was adopted. It was for this reason that he hoped the Institute of Fuel would assume an authoritative position in regard to the use and economy of fuel in this country.

WIDER ASPECT OF THE FUEL PROBLEM.

After giving a brief outline of the subjects to be discussed during the meeting, the President made a few remarks on the wider aspect of the fuel problem as it affects this country at the present time. Some little time ago he accepted the Chairmanship of the National Fuel and Power Committee, which was set-up by the Government to investigate the possibility of economies in fuel and power in this country. That Committee had had a considerable number of sittings, and had examined many important and interesting problems. He had heard some surprise expressed that the Committee had not already issued a report solving every problem in every industry. Of course, if things were as easy as that, it would be quite unnecessary to have any Committee. It was obvious, however, that the scope of the inquiry was a wide one, because the Committee had been asked to look into the problem very generally. Therefore, it

had been necessary to hear a great deal of evidence. The Committee had not issued a report, even of a preliminary character, although he hoped that in the not too distant future one report at any rate would be issued.

He did not wish to forestall the conclusions of the Committee, who had not yet had an opportunity of considering any report; but there were a few things which had struck him personally in the investigation. One was that there was still a great deal to learn in handling coal from the time of its existence in the mines to the washery, in transportation, and in its further use; and though it would be unfair to say that the collieries were inadequately equipped, there were, nevertheless, a great many old-fashioned collieries. There were some problems in connection with these which had not received, in the old days, the study they deserved, and which they should obtain at the present time. In cases of anthracite coal, for instance—an expensive material, which realized a lower price the smaller the size—every endeavour seemed to be made in the handling of it to reduce it to powder, and to turn a product worth 40s. per ton into duff worth only 5s. It was a quick, but inefficient, method of producing pulverized fuel, and seriously handicapped them in their competition with foreign countries in export coal, inasmuch as the degradation of the fuel was so much greater in the handling it received for export purposes than in handling by rail. This was only one small point in the whole problem. Recently he had visited Ellesmere Port, and had been interested to see a fine coal handling plant designed by the Chief Engineer of the Manchester Ship Canal. This was a great advance in methods of placing coal in the holds of ships for export purposes. The problem was receiving much more consideration now than apparently it had received hitherto.

The methods of washing and screening coal generally in use to-day seemed to be uninitiated and extraordinarily crude. Having been brought up in the more delicate chemical industry, he was horrified to see the methods adopted at so many collieries; but yet he was told that these were the only methods which could be adopted. Personally, however, he was a little sceptical that improvements could not be made, if more engineering talent and research were applied to some of the primitive machinery now being used. Fortunately, many new ideas were being discussed and tried; and he had taken a little personal interest in a new washing process which, as far as it had gone on a semi-technical scale, had proved itself remarkable as it enabled the ash to be reduced from a high figure to about 2 p.ct. This process was about to be installed at one of the collieries in which he was interested; and after it had been working for some time on a commercial scale, a little more would be heard about it. There was nothing more terrible than to contemplate the amount of money spent in this country in carrying ash about in the coal from one part to another. A leading gas engineer gave some interesting evidence on this point before the National Power and Fuel Committee, and showed the waste of money in carrying the ash in the coal from the colliery to the gas-works, and then carting it away again after the coal had been through the retorts. It was obvious, too, that by a reduction in the ash content of the coal before it left the colliery, it would be possible to produce qualities of metallurgical and other cokes which might have a vital effect upon metallurgical practice generally. This, of course, involved questions of quality, micro-structure, and chemical composition of coke in blast furnace work; and there could be no doubt as to the importance of the physical and other qualities of coke for this purpose. This must be regarded as an essential part of the work of the Institute.

Some evidence had also been given to the Committee as to the position of the coke industry in this country; and this evidence might be published one day. If that were done, people would be rather surprised, because it was not satisfactory. There were in this country a large number of small and antiquated coke ovens; and when these were compared with some of the enormous installations in the United States and the bigger installations in the Ruhr and other parts of the Continent, it was realized that in this country there was still a great deal to be done. A cheap coke was essential to the revival of the heavy metal industries.

Wake Up England!

There was still a great lack of co-ordinated research work in this country. When one compared the work done in Germany before the war, and continued ever since, with that accomplished in this country, it made one absolutely blush. In Germany they had a magnificently equipped central institution to deal with all the fuel problems of the various collieries. This country, however, was still relatively backward. Attempts at co-operation were becoming more successful; but the amount of money that people in this country seemed to consider adequate to spend on research was absolutely fantastic. The Germans dealt in what he called "mass research work." Where in this country there would be two apparatus at work on a particular problem, the Germans would have a hundred. This obviously saved time, and eliminated their difficulties much more quickly. These results were obtained in Germany not because the Germans were better people or more brilliant, but because of their more systematic working, and owing to the extent to which they spent money on research.

Unless the industries of this country took these problems seriously to heart, they would find themselves in a short time displaced in the industries of the world—and rightly displaced—simply because of the higher technical efficiency and better scientific work carried out in other countries. It was impossible to stop the march of progress of science and ideas; and there was no reason why this country should not do as well as any other in developing scientific progress. From what he knew, he was convinced that there were in this country plenty of able scientific men; and it was up to those who were leading the industries to take every possible advantage of the facilities offered for research work on a continuous and growing scale. He was convinced, for instance, that in the coal industry there was a wide field for development on these lines. In the old days it was a simple matter to sell British coal; but things were changing. The large users of coal to-day required heat units. They needed to know the ash content of the coal. The Germans had trained their people in this direction, and had organized a magnificent system of grading coal, which had been introduced by the German Coal Syndicate. In this way they had become scientific advisers to their customers. The same thing could be done here.

Speaking of possibilities of development in the use of coal, Sir Alfred Mond said that the Germans were actually employing pulverized fuel in Diesel engines—a thing which at one time would have been considered fantastic. If this was developed, it seemed likely that those gentlemen who were obtaining oil from coal could retire into obscurity, because compared with the use of pulverized fuel in this way the production of oil from coal was a laborious and expensive method. In America, too, they were already beginning to think of transporting coal in the pulverized form for various purposes. All this demonstrated the state of flux of what might be thought one of the most stable industries of the world; and it held out great hope for the coal industry. Only by cheaper fuel, better utilization, cheaper power, and cheaper products generally, would it be possible for the nation as a whole to increase its spending power, and in turn to improve the prospects for the industries of the country.

ANNUAL DINNER.

The annual dinner took place at the Wharncliffe Rooms, Hotel Great Central, on Wednesday evening—the President in the chair. After the Loyal Toast had been honoured,

Sir Andrew Duncan (Chairman of the Central Electricity Board) proposed "The Institute of Fuel." Never, he said, had there been a time when industry was at more difficult cross-roads than at present. Every industry was over-burdened with direct social obligations (such as unemployment and health insurance), and with indirect ones (such as contributions to rates and taxes). Industry was calling out for relief, and relief it must have. The conclusion he had reached was that in the future there would be an added permanent burden of industrial costs for which industry must find some other means of compensation; and it was precisely in this direction that the Institute could play a dominant part. There had been too little co-ordination between the industrialists concerned in various industries; and therefore the Institute had done well to get together those persons interested in the fuel consuming industries, because it could afford an enormous amount of help in the technical problems involved in the utilization of fuel.

The President referred to the influence which the work of the Institute must have upon the lowering of the costs of production and increase in national working value. A high standard of living was existing to-day, and such a high standard was a sound investment. Once having obtained this high standard of living, however, there was a natural desire to maintain it; and this could only be done by reducing the costs of production. There was nothing easier to make than a merger of profitable concerns; but, on the other hand, there was nothing so difficult to pool as losses, and this was why it was so difficult to merge unprofitable industries. In the reduction of the costs of production, the distribution of electricity played an important part; and from this point of view recognition must be given to the excellent work being done by Sir Andrew Duncan and his colleagues in unifying and co-ordinating the distribution of electricity in this country. The same principle should be applied in the organization and management of other industries. It was not a question of whether they liked it or not, because wherever one looked in the economic field to-day there was the growth of great units of industry taking place. Capital was more easily obtained by large undertakings than by small ones; and undoubtedly one of the difficulties facing industry to-day in this country was the obtaining of capital for improvements.

Mr. Frank Hodges proposed "The Guests," and asked firms closely interested in the promotion of scientific objects to lend their weight and their money in the work of solving the almost unlimited problems of fuel production and utilization, and to provide, not an Institute on paper, but an actual physical Institute with its own building, its own laboratories, and its own libraries, which would be open to all scientists. It had been said that industry could not afford to provide funds in these days of depression; but if ever there was a time when it was necessary to make a special effort to provide money for research, it was during trade depression.

Engineer Vice-Admiral Sir R. B. Dixon (Engineer-in-Chief to the Navy), in reply, spoke of the hydrogenation of coal, the carbonization of coal for the purpose of obtaining oil, and powdered fuel, and emphasized the necessity for continuing research in these three directions.

GASEOUS COMBUSTION AT HIGH PRESSURES.

By Prof. W. A. BONE, D.Sc., F.R.S.

[Before the Chemical Society on Nov. 24.]

INTRODUCTION.

Up to the end of last century, chemistry was a system of knowledge derived from experimental inquiry into the behaviour of matter within what must nowadays be regarded as the narrow and abnormal physical conditions subsisting on the surface of our earth. For a hundred years we had regarded our "atoms" as minute perfectly solid and unchangeable spheres, capable of producing by mutual interactions almost an infinitude of permutations and combinations, all subject, however, to the classical laws of dynamics, which were believed to be sacrosanct. In our researches we used temperatures up to about 4000 K., and pressures rarely exceeding a few times that of the atmosphere.

Then came a revolution, wrought by the physicists, and more bolshevik than the Russian. Our atoms are now known to be minute solar systems, with electrons moving in planetary orbits around a central nucleus which is composite and mutable. They are subject to orbital displacement or loss of electrons, with consequent activations which conceivably precede and condition chemical changes generally. Such activations may be effected quantum-wise by electro-magnetic radiations in ways inconsistent with the classical dynamics. Astrophysicists have shown us the spectra of atoms successively stripped one by one of their outer electrons. Prof. A. Fowler has shown and fully analyzed four such successive stages in the spectrum of silicon; Paschen three such in the aluminium spectrum; and still higher stages of ionization have been observed by Millikan in the spectra of phosphorus, sulphur, and chlorine.

Astronomers now speak of temperatures of 40 million deg. C. in the interior of stars, assuring us that there is "nothing to be alarmed about" in such statements, because they involve atomic speeds of no more than 100 miles a second, which is trifling compared with the 10,000 miles a second of atoms shot off from radium. They picture the interior of stars as regions densely packed with atoms stripped of electrons, free electrons, and traversed by X-ray radiations, in which matter can have the density of platinum and yet the properties of a perfect gas; and they talk quite glibly about a possible annihilation of matter (or, more correctly, the transformation of mass into radiation) as the result of suitable collisions of protons and electrons and consequent neutralization of their opposite charges.

In his recent monograph on "Stars and Atoms" (1927), A. S. Eddington says:

> It is now well realized that the stars are a very important adjunct to the physical laboratory—a sort of high-temperature annex where the behaviour of matter can be studied under greatly extended conditions. Being an astronomer, I naturally put the connection somewhat differently, and regard the physical laboratory as a low-temperature station attached to the stars. It is the laboratory conditions which should be counted abnormal. Apart from the interstellar cloud, which is at the moderate temperature of about 15,000°, I suppose that nine-tenths of the matter of the universe is above 1,000,000°. Under *ordinary* conditions . . . matter has rather simple properties. But there are in the universe exceptional regions with temperature not far removed from the absolute zero, where the physical properties of matter acquire great complexity; the ions surround themselves with complete electron systems and become the atoms of terrestial experience. Our earth is one of those chilly places; and here the strangest complications can arise. Perhaps strangest of all, some of these complications can meet together and speculate on the significance of the whole scheme.

"All this is very interesting," you may say, "but what has it got to do with combustion at high pressures?" to which I would answer "only in so far as it may prevent our regarding our terrestial chemistry as more than a small fragment of the whole story, and may keep our minds open to the reception of knowledge accruing from a study of gaseous interactions under what until recently would have been considered as abnormal conditions of density and pressure."

When I first attended systematic lectures in chemistry, 39 years ago, much discussion was taking place as to whether certain experiments made by Stillingfleet Johnson in 1881 had resulted (as was claimed) in a synthesis of ammonia when a mixture of nitrogen and hydrogen in suitable proportions was passed over hot spongy platinum or copper. The general verdict of the chemical world was against such claim, because the experiments had been independently repeated, using well-purified gases, with but negative results. Some people (I remember) went so far as to say that ammonia could not be synthesized from its elements by a catalytic process under the influence of heat alone, though it might be so (as Deville had shown) in electric discharge. To-day scores of thousands of tons of ammonia are being manufactured per annum by the interaction of its elements in contact with suitable catalysts at a temperature of 400° C. or so, and a pressure of several hundred atmospheres.

Again, who, even twenty years ago, would have contemplated the technical production of methyl alcohol (synthol) from carbonic oxide and hydrogen under high pressure in contact with a suitable catalyst?

While we chemists cannot perhaps hope to emulate the astrophysicists in their flights to the stars, we have at least learnt enough from our terrestial experiences to realize that, had the pressure of our atmosphere been a few hundred times what it actually is, in some respects chemistry would have had a rather different story from what hitherto we have been accustomed to hear; and to-night it will be my endeavour to show you one particular in which it might have so differed.

When so many recent developments in other fields of investigation have shown what an important part pressure *per se* may play in chemical interactions, chemists will hardly be surprised on hearing that it has produced unexpected results in gaseous explosions. For, apart altogether from purely chemical or thermodynamical factors, the physical consequence of high-pressure, and especially radiation, effects in such transactions may be considerable. For, seeing that the chief difference between conditions of high and low pressures lies in the absolute conditions of the interacting molecules, it may be expected that factors the operations of which chiefly depend on such concentration will become more dominant as the pressure rises. Indeed, the value of high-pressure work lies in the fact that it accentuates the operation of factors the influences of which are either masked or overlooked at ordinary pressure.

In high-pressure explosions a sudden high temperature is superposed upon an initial high density of the gaseous medium, and we are able to study experimentally the combined effects of both conditions. Generally speaking, the increased density, involving as it does a proportionate increase in the number of molecular collisions per unit of time, causes a great increase in the absolute amount of chemical change in the medium per second; also the higher the density, the less proportionately are the effects both of cooling by the walls of the containing vessel and of dissociation, and therefore the higher is the maximum temperature attained. Finally, and by no means least, an increase in the density of the medium may affect both the emission and the absorption of radiation during the explosion; and, as radiation is now known to play an important rôle in activating molecules, new phenomena may become prominent in high-pressure explosions which are scarcely noticeable at lower pressures. My researches into gaseous explosions at high initial pressures were commenced at the University of Leeds twenty years ago, and after being interrupted by my removal to London and by the war, were resumed at the Imperial College, South Kensington, in 1919, since which they have been continued without break, save for one of a few months after the sad accident which ended poor W. A. Haward's life in December, 1920. From 1921 Drs. D. M. Newitt and D. T. A. Townend have been my chief collaborators; and with their assistance we are now equipping two new high-pressure gas research laboratories which in the near future will enable us considerably to extend the scope of the work, and to offer to others opportunities for training in our research methods.

The heavy capital costs of the expensive apparatus have hitherto been defrayed out of a series of grants made by the Government Grant Committee of the Royal Society and of the Department of Scientific and Industrial Research, to whom all thanks are due. In order to ensure the necessary future financial provision for the new extension of the work now contemplated, the Advisory Council of the "D.S.I.R." have increased their present generous staff-subsidy, and Imperial Chemical Industries, Ltd., have donated £3000 for new equipment, together with an annual grant towards its running costs. These most welcome aids will enable us now to apply our whole strength to the experimental work, free from financial worries concerning it; and we would take this opportunity of expressing our heartfelt thanks to both the "D.S.I.R." and Imperial Chemical Industries for their timely and generous provision for its needs.

We are now nearing the completion of the more important experiments comprised in the first section of the work dealing with explosions of H_2-air, CO-air, and CH_4-air mixtures at initial pressures up to 200 atmospheres; and we hope soon to commence the next section, which will comprise initial pressures between 200 and 1000 atmospheres.

As it is manifestly impossible for me, in the time at my disposal, to review all our results to date, I will limit myself to the explosion of carbonic-oxide-air mixtures as being the most interesting case for our discussion, because it brings out several new points of fundamental importance. In order, however, to make these clear to you, it will be necessary for me to contrast the behaviour of such mixtures with that of the corresponding hydrogen-air mixtures in similar circumstances.

Presumably, to an audience of British chemists familiar with the classical discoveries of H. B. Dixon and your President, it

is unnecessary for me to recall that, though at first these might seem to be the simplest cases of gaseous combustion, yet they present features of extraordinary interest and complexity which for nearly fifty years past have baffled all the efforts of what my good friend Prof. H. E. Armstrong has playfully called our "stupidity" to fathom. Well, we are but as God made us; and if we cannot take you to Waterloo by his special "Ghost Train" express, at least we can show you what is to be seen from the windows of our unromantic Bummelzug.

SUMMARY OF REVIEW OF EXPERIMENTAL WORK.

The lecturer then proceeded to describe the bomb apparatus and experimental methods used in his researches upon high-pressure explosions at the Imperial College, South Kensington. The apparatus included spherical bombs capable of withstanding explosion pressures up to 2000 atmospheres, and a large cylindrical bomb (explosion chamber 100 cm. long by 5 cm. diameter; capacity 2 litres) provided at each end with plugs carrying the quartz windows used in connection with spectrographic observations upon explosion flames. The walls of this bomb were capable of withstanding explosion pressures of 1200 atmospheres, and the quartz windows had been successfully used in experiments developing pressures up to about 500 atmospheres. He also described the Petavel recording manometer and its optical accessories, which had been used for obtaining photographic pressure-time curves during the various explosions. It should be understood that the maximum pressures developed in their explosions had been usually between eight and twelve times the initial pressures, and that the P_m/P_i ratio had always increased with the initial pressure in any particular case. The maximum temperatures had been anything up to 3000° C., or even higher in a few cases.

In passing on to a description of the experimental results, Prof. Bone first of all drew attention to the striking contrast between the behaviour of theoretical hydrogen-air and carbonic-oxide-air mixtures respectively, when each is exploded at an initial pressure of 50 atmospheres. In the former case the pressure rises in about 0·005 sec. to its maximum (about 400 atmospheres) and almost immediately begins to fall and to assume the character of a simple cooling curve. In the latter case, however, the pressure rise is much slower; the maximum (about 410 atmospheres) only being reached after 0·18 sec., after which it is maintained for a considerable time interval before the subsequent "cooling period" sets in. He next described how the Bone-Haward experiments of 1920 had shown that the replacement by hydrogen of a very small portion of the carbonic oxide in a theoretical CO-air mixture enormously accelerates the pressure rise on explosion at an initial pressure of 50 atmospheres. This effect, he said, could be ascribed to the combined operation of two causes—namely (1) the counteracting of hydrogen upon nitrogen activation in such explosions, and (2) the fact that hydrogen is a most potent catalyzer of CO-combustion.

He next proceeded to describe the experiments made with the assistance of Drs. D. M. Newitt and D. T. A. Townend, during which the new phenomenon of nitrogen activation in CO-air explosions at high initial pressures had been discovered. This led on to a consideration of the effect of increasing the initial pressure in such explosions, which was shown to be contrary to that hitherto observed in all other cases. The theory of nitrogen activation by the peculiar radiation emitted from $CO\text{-}O_2$ interactions in such explosions was then explained.

The next section of the lecture dealt with the secondary production of nitric oxide, consequent upon the primary nitrogen activation, when excess of oxygen was present in $CO\text{-}O_2\text{-}N_2$ explosions at high initial pressures. Evidence was forthcoming that such NO-formation is more a pressure than a temperature effect, and is consequent upon the primary nitrogen activation referred to. Incidentally, it had been shown spectrographically that at initial pressures certainly up to 25 atmospheres, and possibly also much beyond such NO-formation does not occur during the explosion period itself, but only during the cooling period after the maximum pressure has been passed.

In the concluding portion of the lecture, some of the spectrographic evidence obtained during the investigations was dealt with. This had proved (*inter alia*) (1) that steam does not function chemically, but that carbonic oxide reacts directly with oxygen, in CO-air explosions; (2) that the radiation emitted in such direct CO-Ox interactions is strongly absorbed by either carbonic oxide or nitrogen; and (3) that in a CO-excess air explosion at 25 atmospheres initial pressure, no nitric oxide is formed during the actual explosion period, though more than 2·5 p.ct. of nitrogen peroxide was found in the cooled final explosion products.

POTENTIAL INVESTMENTS.

III.—THE SHEFFIELD GAS COMPANY.

The Sheffield Gas Company has one of the largest outputs of gas of provincial companies, and last year (1926) sold over 5000 million c.ft. of gas, or 25 million therms. The Company was incorporated by Special Act of Parliament in 1855 as the Sheffield United Gas Light Company, and further powers were obtained in various Acts between the years 1866 and 1924. The statutory area of supply covers 47 square miles, and comprises the City of Sheffield, Norton Rural District, Dronfield Urban District, part of Rotherham County Borough and Rural District, and parts of Chesterfield and Wortley Rural Districts. The population of the area is about 530,800, and the number of gas services connected is 125,300.

The capital, as shown by the last accounts, is as follows:

	Authorized and Issued. £
Share capital—	
Class "A" stock	270,000
"B" "	419,968
"C" "	1,047,000
Loan capital—	
Debenture stock (4 p.ct.)	95,000
Mortgages (7½ p.ct.)	485,000

Under the Company's Act of 1917, further powers were obtained to raise £600,000 in ordinary or preference stock or shares, and £200,000 loan or debenture stock; but no amount has up to the present date been raised.

Transfer arrangements, common form. Fee for registration of transfer or marriage, 2s. 6d.; probate or death in joint holdings, 5s.; power of attorney or distringas, *nil*. All classes of stock can be transferred on same deed without extra fee. Stocks are transferable in amounts and multiples of £1. Smallest holding allowed, £10. Husband's witness of wife's signature, or vice versa, not accepted. Voting—one vote for every £50 capital stock up to £1000, and one vote for every £1000 beyond.

Accounts and dividends: The accounts are made up annually to Dec. 31, and submitted in March; an interim dividend being paid in September. Under the Company's Act of 1922, a basic price of gas was fixed at 7d. per therm, which price may be revised by order of the Board of Trade in accordance with section 1 of the Gas Regulation Act, 1920. The basic rates of dividend are as follows:

On "A," "B," and "C" stocks	5 p.ct.
On ordinary capital issued after the passing of the Act of 1922	7 ,, (maximum)

The Company may increase or reduce the price charged above or below the basic price, but except under the conditions shown below shall not in any one year pay any dividends on the ordinary capital in excess of the basic rates.

DIVISION OF SURPLUS PROFITS.

At the end of each year or half-year, a calculation shall be made of the amount (if any) by which the total sum paid or payable by consumers for gas supplied during the year (or half-year) is less than the total sum which would have been payable if the gas had been charged for at the basic price; and the amount so arrived at is referred to as "the consumers' benefit." If and so far as the balance standing to the credit of the net revenue account (after providing for dividends at the basic rates on the ordinary capital) in the opinion of the Directors permits, a sum not exceeding one-third of the consumers' benefit shall be applied in two equal parts for the benefit of the holders of ordinary capital and of employees respectively. The sum so to be applied for the benefit of the holders of ordinary capital may be applied in the increase of the dividends above the basic rates, and if and so far as not so applied shall be carried to the reserve fund, which shall be applicable (*inter alia*) in or towards increasing above the basic rates the dividends on the ordinary capital, or in making-up the dividends to the basic rates. In any reduction of the basic rates of dividend a proportionate reduction is to be made in the rate paid on each class of ordinary capital. Excess dividends above the basic rates are to be at the same rate on each class of ordinary capital.

The financial clauses of the Act are to all intents and purposes the same as those of the South Metropolitan Gas Company, except that the basic price is 7d., as compared with 11d. Briefly, the powers may be stated as follows: Any sum which may be saved to the consumers by reason of the average price received for gas being below the basic price of 7d. per therm entitles the Directors, after providing for dividends at the basic rates on the ordinary capital, to divide equally between such

stockholders and the employees a sum not exceeding one-third of such saving.

The Company sells a very large quantity of gas for industrial purposes, and has always been a pioneer of cheap gas. The present net selling price varies from 6½d. to 3d. per therm, according to scale, and the declared calorific value is 500 B.Th.U.

The following table illustrates the progress made. The period of the war and the four subsequent years have, by reason of the abnormal conditions prevailing, purposely been ignored:

Year	Average Maximum Price of Gas per 1000 C.Ft.	Quantity Sold. Million C.Ft.	Capital Expended per 1000 C.Ft. Sold.	Gross Profit.	Dividend and Interest. (See Note.)	Rate of Ordinary Dividend. P.Ct. per Annum.	Amount Carried Forward and Balance Reserve Fund.
	s. d.		s. d.	£	£	£ s. d.	£
1903	1 10	2,688	7 0	112,849	88,765	10 0 0	144,844
1908	1 3	3,329	5 10	72,201	89,111	10 0 0	168,291
1913	1 2	4,546	4 4	73,014	88,390	10 0 0	177,872
	Per Therm. d.	Therms.	Per Therm. s. d.				
1923	7·65	21,416,565	1 4	134,806	126,064	5 4 2	136,190
1924	7·12	22,827,375	1 4	136,317	135,962	5 12 6	141,575
1925	7·00	24,002,770	1 3	130,696	134,852	5 15 0	139,902
1926	7·10	25,197,690	1 2	124,046	134,281	5 15 0	132,265

NOTE.—Includes amount (if any) carried to reserve fund.

At December, 1926, the amount standing to the credit of the special purposes fund was £68,502.

The Company suffered severely owing to the depressed state of trade for a short period after the war; but subsequently there has been a steady improvement in the sales of gas, and for the year 1926 the output was over 90 p.ct. above that for 1903. Future prospects are particularly good.

The following table shows the prices of the highest and lowest transactions (Sheffield Exchange) on the "A," "B," and "C" stocks, the dividends paid, and the yield on the average price during the past four years:

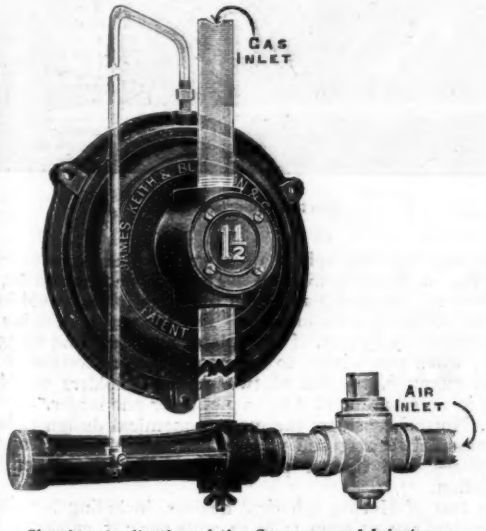
Year.	Transactions.		Dividend. P.Ct. per Annum.	Yield P.Ct. per Annum.
	Highest.	Lowest.		
			£ s. d.	£ s. d.
1923	105½	95⅝	5 4 2	5 3 8
1924	105½	97⅛	5 12 6	5 10 8
1925	105½	99	5 15 0	5 12 4
1926	101	96	5 15 0	5 16 9

Since the year 1922 the same rates of dividend have been paid on all three classes of stock, and the quotations of each stock have also been identical. During the current year the market value of the stocks has risen appreciably; and at the present time the average quotation in Sheffield is 103, yielding £5 11s. 8d. p.ct.—the London average being 102½. In comparison, the yield of the Gas Light and Coke Company at 90 is £5 18s. 6d. p.ct., and of the South Metropolitan Company at 103 £5 16s. 6d. p.ct.

GAS AND AIR MIXTURE CONTROL.

Automatic System.

As is well known, great difficulties are experienced in maintaining the correct mixture of gas and air when air blast is used in conjunction with gas-heated appliances. At times conditions vary so much during the course of working that it is impossible to make perfect compensation by hand. The automatic mixture control system of the Keith Blackman Company has been in successful use for many years in overcoming these difficulties; and it results in considerable economy. In many plants it is necessary to maintain a reducing or oxidizing atmosphere; and the advantage of being able to control the mixture automatically is obvious. The system automatically corrects for variations in gas pressure, in air pressure, or in furnace resistance which might be due to the difference between hot and cold conditions, more or less obstruction of the material in the furnace, opening and closing of doors, and alteration of flue resistance. Further, the temperature required may be varied at will without upsetting the correct proportions of gas to air, and this by the manipulation of one cock only—viz., that controlling the air pressure.



Showing Application of the Governor and Injector.

The plant comprises a special form of mixer or injector and a control governor, the function of which is to admit the gas to the mixing injector at zero pressure; or, in some circumstances, the governor is set to deliver gas to the injector at either lower or higher pressures than zero.

In regard to the injector or mixer, this is of such design as thoroughly to mix the gas and air and deliver same at pressures as high as have been found necessary in good practice, without requiring those high pressures usually called for in high-temperature furnaces. The mixture pressure can be obtained by the use of comparatively low air pressures provided by blast fans, instead of having to resort to positive rotary blowers or positive compressors.

It has been established that a mixture pressure of 6 in. w.g. (corresponding to a velocity of issue of about 150 ft. per second) is a maximum necessary in the highest temperature work.

One or more burner nozzles can be connected and used from each injector, though each injector must have its own separate governor.

From the above description it is obvious what a wide range of usefulness this apparatus covers and what economies can be effected by its adoption. Moreover, there is the certainty that the apparatus will take care of varying conditions without the proportions of the mixture altering. The apparatus is made in many sizes. Gas companies who are faced with heating problems from time to time could standardize on the main apparatus; the application of each problem being considered individually.

NEW TURBULENT BURNERS.

The design of a really efficient burner has naturally proved to be a much more difficult matter with pulverized coal or other solid fuel, including coke, than in the case of gas or oil. Great interest attaches, therefore, to a new burner that has been perfected which is claimed to have solved the problem, and to take indiscriminately gaseous, liquid, or pulverized solid fuel. In the case of steam generation by water-tube boilers, one of the outstanding objections of pulverized fuel firing has been the very large combustion chamber necessary. Thus, for example, in a standard boiler, with the usual row of burners at the top, pointing downwards, the total length of the flame is about 30 ft. As a result the chamber itself has had to be about 50 ft. high with a setting of 100 to 120 ft., while pulverized fuel firing has not yet made any progress with Lancashire boilers and ordinary industrial boiler plant, and the same applies to Scotch marine boilers. A remarkable advance has now, however, been made in the shape of a new burner, whereby it is claimed the combustion is finished in a flame approximately only 10 ft. long, so that the combustion chamber volume can be cut down by half, with an enormous saving in the capital cost of the setting. Further, this new burner will take up to 150 million B.Th.U. per hour—that is 6 tons of coal or 4 tons of heavy oils—an enormous figure, so that instead of a row of ten to twelve burners in the combustion chamber roof, some three to four burners only will take the load, resulting also in a simpler design of brickwork and arches. The new burner is a British invention, a result of the Research Department of a very prominent firm in the world of fuel technology, while the final design has now been running for many months continuously in England. The "turbulent" principle is used, but with no bent supply pipes, and stratification—that is, the separation of the air and the finely divided particles of coal at the burner tip—has been eliminated. Also when once set, by a small damper on the secondary air supply only, no further adjustment is required.

HORTON SPHERICAL GASHOLDER.

By W. S. GRAY, B.A., M.A.I. (Dublin), of the F.C. Construction Company, Ltd., Derby.

During recent years centralized production has become a prominent feature in the gas industry in the United States; the secondary gas companies purchasing their supply from the larger concerns.

Under these conditions the problem of supply is reduced to feeding a large number of small communities, each of which has its own supply main, from one central station at a distance of some miles. Sufficient gas must be stored at the subsidiary works to tide over the peak demand, which ranges in the U.S.A. from 2½ to 3 times the average consumption. For this reason the companies have found it necessary to construct small local holders which will require only a very limited ground space and will be low in maintenance costs.

To answer these requirements, the Horton holder (described in "Le Génie Civil," Sept. 10, 1927, and previously in the "JOURNAL" for March 17, 1926) has been designed. The following description is compiled from the French article.

The holder, constructed by the Chicago Bridge and Iron Works, is spherical and of constant volume, and the gas is stored under pressure. As the price of such a holder is proportional to its volume, it is immaterial whether one holder of volume V or n holders of volume $\frac{V}{n}$ are used. The spherical holder is of a less displeasing form than the ordinary one, so that less objection is raised to its erection in a residential neighbourhood.

Generally the holders are connected to a low-pressure network and are supplied with an automatic Ingersoll-Rand compressor. In storing gas under pressure, one has the option of using either a cylindrical or a spherical container. Mr. Horton adopted the latter shape as the result of his calculations concerning the relative economy of the two.

Considering a cylindrical container with hemispherical ends of volume V and holding gas under effective pressure P, the relation between the volume of the reservoir and the volume V_a, measured under atmospheric pressure, of the gas which escapes when the effective interior pressure falls from P to P_L is, by Marriotte's Law,

$$\frac{V_a}{V} = \frac{P - P_L}{P_a} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (1)$$

where P_a denotes the atmospheric pressure.

Suppose W = weight of the container (kg.)
e = thickness of plates (metres)
η = efficiency of joints
t = allowable unit stress (kg. per sq m.)
r = length of cylinder (L) metres / diameter of cylinder (D) metres

and using kg. and metres as units, and 7800 kg. per cub.m. as the density of steel, the thickness of the cylindrical wall being twice that of the hemispherical ends, we get:

$$W = 7800\,\pi\,D^2\,(1 + 2r)e \quad . \quad . \quad . \quad . \quad . \quad . \quad (2)$$

The necessary thickness of the ends is:

$$e = \frac{PD}{4\,\pi\,t} \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad . \quad (3)$$

$$\text{and } V = \frac{\pi\,D^3}{24}\,(4 + 6r) \quad . \quad . \quad . \quad . \quad . \quad . \quad (4)$$

(NOTE.—P is in kg. per sq.m., and V in cub.m.)

Eliminating D between (2), (3), and (4), we obtain:

$$W = 46{,}800 \times \frac{PV}{\pi t} \times \frac{1 + 2r}{4 + 6r} \quad . \quad . \quad . \quad . \quad (5)$$

and eliminating V between (1) and (5), since P_a = 10,300 kg. per sq. metre:

$$W = \frac{482 \times 10^6}{\eta T} \times \frac{1}{1 - \frac{P_L}{P}} \times V_a \times \frac{1 + 2r}{4 + 6r} \quad (6)$$

Thus W is directly proportional to V_a (the volume of the stored gas under atmospheric pressure), and independent of the maximum pressure P, but dependent on the ratio $\frac{P_L}{P}$ of the limiting pressures. If P_L = 0, the pressure term vanishes in equation (6). Finally, the weight W depends on the ratio $\frac{1+2r}{4+6r}$, which increases from ⅓ when r = 0 (or the container is spherical) to ½ when r is infinitely great and we are dealing with a very long cylinder of small diameter.

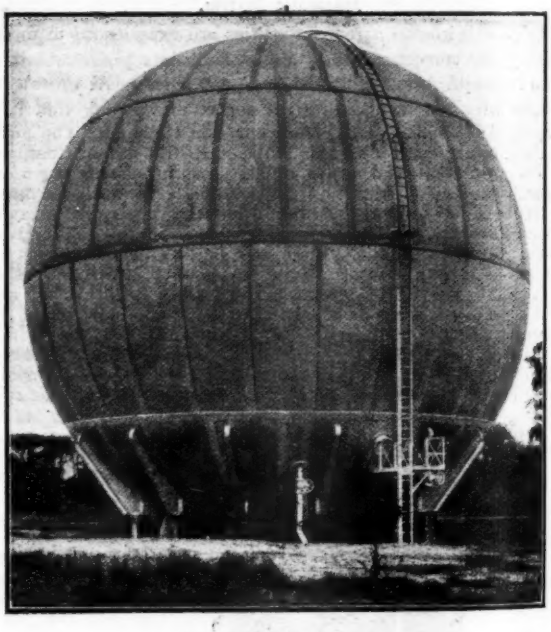
The cost of manufacturing spherical holders is above that of cylinders for the same weight of metal used.

Mr. Horton estimates the increased cost of manufacture of the spherical part as between 10 p.ct. and 20 p.ct. Taking 1000 as the basis cost of a sphere, the comparative costs of different shapes, under assumptions of 0, 10, 15, and 20 p.ct. increase in value of spherical work over cylindrical for the same weight of metal, are shown in the table for the same holder capacity V_a.

Values of r.	Comparative Costs.			20 P.Ct.
	0 P.Ct.	10 P.Ct.	15 P.Ct.	
0 (sphere). . . .	1000	1000	1000	1000
1	1200	1128	1096	1067
2	1250	1159	1119	1083
3	1275	1174	1130	1091
4	1286	1182	1136	1094
5	1294	1188	1141	1100
10	1312	1199	1148	1103
∞ (cylinder) . . .	1333	1212	1159	1111

Thus under ordinary conditions about 15 p.ct. economy is secured by using the sphere. This is, of course, because the sphere has the largest volume of all solids for a given superficial area, and because the stress in the wall of a sphere is only half that in a cylinder of equal diameter and thickness.

Example.—It is required to store under a pressure of 2·1 kg. per sq.cm. a quantity of gas the volume of which at atmospheric pressure is 14,150 cub.m. From (1), the volume of the holder should be 7075 cub.m.; and supposing the working stress in the steel to be 9·6 kg. per sq.cm., from (5), since r = 0 for a sphere, P = 2·1 × 10⁴ kg. per sq.m., T = 9·6 × 10⁴ kg. per sq.m., and η = 0·785, we get W = 225,000 kg., neglecting the weight of coverplates.



Horton Spherical Holder.

We may use one sphere of 23·50 m. diameter, or two of 18·60 m., or three of 16·20 m. The thickness would be, from (3), 0·016 m., 0·013 m., and 0·011 m. Lap joints would be used with the latter two thicknesses. The theoretical weights must be increased by 45 p.ct. if coverplates are used, and by 35 p.ct. if not, when one wishes to estimate the total weight of steel. In the example, the use of two or three holders would thus result in an economy of 8 to 10 p.ct. over one larger.

Mr. Horton considers the most economical design to be of a thickness between 11 and 13 mm. Greater thicknesses require coverplates, and thinner plates are much more expensive in fabrication.

The cost of Horton spherical holders, including foundations, in America, ranges from 11 to 17 cents per c.ft. capacity. Ordinary gasholders cost 24c. per c.ft. for capacities of 100,000 c.ft., and 9c. per c.ft. for a capacity of 10 million c.ft. Thus it is only when the capacity exceeds about 2 million c.ft. that the ordinary type is cheaper.

Mr. Horton claims that the maintenance charges are less with the new type, and that there is no need for anti-freezing apparatus, or pumps such as the waterless holder requires. The foundations have, of course, a much lighter load to carry—a not unimportant fact in some cases.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

QUARTERLY MEETING IN LEEDS.

The 208th Quarterly Meeting of the Institution was held in Leeds on Thursday, Nov. 24; and by the invitation of the Chairman and Members of the Leeds Gas Committee, visits were paid to the Meadow Lane and the New Wortley Gas-Works.

LUNCHEON.

The members of the Institution were subsequently entertained at luncheon in the Lord Mayor's Rooms at the Town Hall; and immediately prior to luncheon being served Mr. T. BANBURY BALL (Rochdale), one of the oldest members of the Institution, and President in 1889, invested the President with an official badge to be worn by him during his period of office

The President's Badge
(Copyright Design).

and subsequently by his successors. The description of the badge is as follows: Gold and finely chased, with enamel coat of arms of the City of Leeds, and with Lancashire and Yorkshire Roses, with enamel flambeau in centre, supported by scroll bearing the word "President."

There were about 130 guests present, among them being Alderman Geo. Ratcliffe, J.P. (Lord Mayor of Leeds), Mr. B. B. Waller (Geo. Waller & Sons, Ltd., Stroud), Mr. A. Proctor (Chairman of the York Gas Company), Councillor A. E. Wilkinson (Deputy Lord Mayor), Mr. W. H. Bennett (Managing Director of the Redhill Gas Company), Alderman T. Oldroyd, J.P., Councillor E. J. Clarke (Chairman of the Leeds Gas Committee), Alderman J. Noon, J.P. (Deputy Chairman of the Leeds Gas Committee), Mr. W. M. Mason (Manager of the British Commercial Gas Association), and Mr. P. C. Shapley, A.M.I.Mech.E. (West's Gas Improvement Co., Ltd.).

The LORD MAYOR OF LEEDS, in proposing the toast of "The Manchester Institution of Gas Engineers," referred to the importance of visits of technical and industrial associations to centres other than their own for the purpose of acquiring a knowledge of the most up-to-date and scientific methods of conducting their business. Thirty years previously, when he first became a member of the Leeds City Council, it was a custom to publish pamphlets protesting against the practice of public representatives visiting other towns for that purpose, and spending the ratepayers' money in doing so. Even at that early stage in his municipal career he had publicly stated that while he represented his local authority he would always advocate such visits, not only upon the part of elected municipal representatives, but also in the case of departmental staffs. The expenditure of money for the purpose of acquiring knowledge and technical experience was an act of wisdom, being quickly conducive to the elimination of wastefulness and possible extravagance. Looking round the assembled guests, he noticed several who had received their training in Leeds, and had been allowed to go to other places, doubtless greatly to their own personal benefit, because a prophet had no honour in his own country. He had himself worked with them all, and was therefore greatly pleased to be able to welcome such old friends as Mr. Halkett, Mr. Bond, Mr. Jennings, Mr. Shewring, and Mr. Tooley.

Mr. C. S. SHAPLEY (President) responded to the toast, and in doing so read a copy of a letter written by Mr. Thomas Newbigging to Mr. Whatmough in 1919. Mr. Shapley referred to Mr. Newbigging as one of the oldest members of the Institution and one of the grandest men who had ever been interested in the gas industry. In his letter, Mr. Newbigging gave an account of the early history of the Institution. He stated that in the year 1870 he obtained an appointment as Gas Engineer at a works in Pernambuco. As soon as this became known, a number of his friends held a meeting, and decided to present him with a memento before leaving England. A further meeting was held at the Mitre Hotel, Manchester; and the memento, which was a beautiful silver salver bearing an appropriate inscription, was duly presented. At the conclusion of the gathering, someone suggested it would be an excellent idea to hold periodic meetings. The suggestion was adopted, and thus originated the Manchester District Institution of Gas Engineers.

"THE CITY OF LEEDS GAS DEPARTMENT."

Mr. J. WILKINSON (Engineer and Manager to the Nottingham Gas Department, Ex-President of the Institution of Gas Engineers) pro-

THE PRESIDENT,
C. S. Shapley, of Leeds.

posed the toast of "The City of Leeds Gas Department." He stated that the total income from the Leeds gas undertaking since the transfer to the Corporation was approximately 22 million pounds sterling, while the gross profits during the same period were approximately 5 millions sterling. Very great improvements had also been carried out in the works, particularly during the past ten years. He was pleased to mention that the Lord Mayor had a record of 30 years' continuous service in the Leeds Gas Department, either as Chairman or as Deputy-Chairman. Possibly this record could not be equalled in the case of any other municipal gas undertaking in the country. As far as the management of the undertaking was concerned, they all knew of the work Mr. Shapley had accomplished not only in the sphere in which he was most immediately concerned, but also for the gas industry generally.

Councillor E. J. CLARKE (Chairman of the Leeds Gas Department) responded to the toast. He said he desired to associate himself very heartily with the statements of the proposer regarding the Lord Mayor and Mr. Shapley. Personally, he also strongly held the view that visits of civic committees or of technical or industrial institutions to other centres were likely to prove of incalculable value to all concerned. It had been his lot, in days gone by, in the Leeds City Council, to defend the expenditure entailed through such visits by civic representatives, or in entertaining the representatives from other districts who were visiting Leeds. He had conscientiously felt it to be his duty to do so, owing to the great value which accrued as the result of such delegations.

"THE VISITORS."

Councillor A. DOBBS, J.P. (Leeds), proposed the toast of "The Visitors," and Mr. B. WALLER (Member of the Council of the Society of British Gas Industries) responded, stating that the great gas undertaking of Leeds had been an object lesson to many.

Mr. W. M. MASON (Manager of the British Commercial Gas Association) also responded. He said that the gas industry had three great duties it tried to perform. The first was a duty to itself, in that it endeavoured to run its affairs upon commercial lines, and all it required was a free field and no favour. Competition was a good, healthy, stimulating thing. The second duty was to its consumers, and to see that the service side of the industry was made as efficient as possible. The average gas consumer had a very poor idea of the meaning of service, and did not seem to understand what gas could do for him. Gas was now being used in over 3000 trades with an

average of seven processes in each trade. The third point was the duty of the industry to the community generally. The gas industry held the solution to the smoke abatement problem.

BUSINESS MEETING.

The quarterly business meeting was then held in the City Council Chamber—the PRESIDENT in the chair.

ELECTION OF OFFICERS FOR 1928.

Messrs. G. S. FRITH and J. BRIDGE were appointed Scrutineers of the ballot papers for the election of officers for 1928. The following was the result of the ballot:

President.—Mr. R. H. Ginman, of Leek.

Vice-Presidents.—Messrs. W. B. McLusky, of Halifax; and W. J. Smith, B.Sc., of Bolton.

Hon. Secretary and Treasurer.—Mr. W. Rogerson, of Middleton.

Committee.—Messrs. H. E. Stone (Birkenhead), G. Dixon, B.Eng. (Lancaster), and W. Buckley (Droylsden).

Auditors.—Messrs. William Hill, of Stalybridge; and Francis Elliott, of Leyland.

NEW MEMBERS.

Mr. T. H. Poulson, Engineer and Manager, Gas-Works, Stafford, and Mr. F. Greenhalgh, Engineer and Works Manager, Gas-Works, Oldham, were introduced.

PRESIDENTIAL ADDRESS

of C. S. SHAPLEY, of Leeds.

The Hon. Secretary, at the last meeting of the Council, expressed the desire that I should say a few words at the next meeting of our Institution. I could have wished to be excused, as I have had a very busy year owing to the reconstruction of a great portion of our plant. We have also just approved plans in connection with a scheme to cost upwards of £100,000, for a new distribution department and workshops, to the opening of which the Committee will, I hope, invite our Institution. The foregoing, and the multifarious duties every gas engineer is called upon to perform, together with all the necessary meetings we have to attend, I am sure you will agree, leave a man really very little leisure to sit down and prepare an address. However, I hope the few remarks I am going to make will prove acceptable to you; and I should welcome open discussion on any of the points I have raised.

If I must confess to a weakness in my education, it is the writing of papers or preparing written addresses. I would much prefer to speak extempore; but in this I am up against the Press, who always like to have advance copies of what one is going to say, and having regard to the excellent work they do for the industry, one feels in duty bound to respect their wishes. The writer of a paper is then faced with the selection of subjects upon which he is going to talk, and even a President has to be careful not to offend the susceptibilities of his confrères in the industry.

It is six years since the Leeds Gas Committee had the pleasure of receiving members of the Manchester District Institution of Gas Engineers in the city; the last visit having been on the occasion of the Gas Exhibition held in November, 1921. It is very gratifying to be again honoured by your presence to-day in such large numbers.

I sincerely hope that members have gathered some useful and interesting information during their visit to the works this morning, which will compensate them for the time they have given; and I trust that the younger members of the Institution will have derived some educational benefit which will help them in their future career. To the whole body, may I say how much I appreciate the assistance I have had from all the members, and how I value the continued expression of support which has prompted so many to travel from Lancashire, Cheshire, and beyond, to visit Yorkshire once again?

Looking through the list of preceding Presidents of this important Institution, I find that only two members other than myself have had the honour of being elected President two years in succession. These are the late Mr. Joseph Wood, of Bury, and the late Mr. J. G. Newbigging, of Manchester. I am now, through confidence placed in me by the members, sharing this honour, of which I am proud; and I hope that when I hand over the reins to my successor, members will think that I have upheld the traditions of the office.

My first year was unfortunately overshadowed by the coal dispute; but despite this I feel that some of the things we learnt by the problems which arose in that troublous time were ultimately of considerable help to us in our progress as gas engineers. It is only necessary to recall the general strike of last year to realize how loyally trades unionists stood by the gas industry. In addition to being well led, there was a feeling of mutual co-operation between the employees, the union leaders, and the employers; and here I think it is fitting to pay testimony to the activities of the National Gas Council for their good work with regard to the labour movement. I firmly believe that these stoppages are avoidable, if properly dealt with. In my opinion, trades unionists and trades union leaders are not unreasonable people to deal with, and are always willing to listen to the employers' side of the question.

QUALITY OF GAS.

Certain latitude was granted the industry during the period in question, regarding the quality of gas to be supplied, with a view to effecting economy in coal. I am sure we should all like to record our appreciation of the manner in which the Gas Referees faced a really difficult task, and allowed the industry the latitude they did.

The circular issued by that body immediately caused gas engineers to ask themselves the question: "What is the best quality of gas to distribute to consumers?" As soon as one cogitates on this subject, avenues of thought are opened-up which give rise to considerable discussion. It would be interesting to know how many undertakings who have adopted the Gas Regulation Act of 1920 have since wondered whether the quality they declared to the Gas Referees would be the same had they known what the stoppage taught them, and how many have altered their declared value as a direct result.

I am confident that many undertakings, had they had a carburetted water gas plant, would have declared an entirely different value; and I would like here to stress the value of such a plant to gas undertakings, not only in times of coal stoppage, but also when the coke market is adverse. Our own plant has proved itself to be of inestimable value. Even leaving out previous stoppages and adverse markets, in the last stoppage alone our carburetted water gas plant more than paid its total cost, inasmuch as its capital value is £74,000, and had not the plant been available 47,000 tons more coal would have had to be purchased, at an additional cost, after allowing for increased income from residuals over contract prices, of £74,650. The whole of this would have been reflected in the price of gas charged to consumers. The plant is capable of producing upwards of 5½ million c.ft. of gas a day. I would therefore strongly urge members to consider seriously the provision of auxiliary plant which can be brought into operation, during such times, at very short notice.

However, to revert to my subject, I am not going to make any attempt to advise on such a controversial topic as, "What is the best quality to send out?" But from experience in Leeds, a gas of 470 B.Th.U., constant in pressure and quality, has proved satisfactory (having regard to the fact that the plant in Leeds consists of West's continuous verticals, Dempster-Toogood continuous verticals, Dessau intermittent verticals, horizontal settings, inclined settings, coke oven gas and carburetted water gas); and we are convinced that the quality referred to allows of such elasticity with regard to manufacture as admirably suits our plant. This, I think, is borne out when one considers that, although our consumers number upwards of 125,000, the average complaints of all descriptions, including penny fast, unsteady light, box full, burner adjustment, &c., only amount to 73 per day.

Another important aspect of the dispute is that we are all the poorer for our experiences; and many gas undertakings are still groaning under the burden of the losses they suffered by the abnormal conditions. In many cases this burden will be felt for a considerable time; and it is now reflected for a number of undertakings in the high price charged for our commodity. This, and the boost given by the Government to electricity, will have the effect of further retarding our progress. Therefore, if we are to maintain our supremacy, we must, above all things, be efficient, with mind and eye ever alert to take advantage of fresh channels which will, in every possible way, further extend the activities of the industry.

No far-reaching or lasting results have ever been attained without concentrated effort; and I feel sure I am voicing the thoughts of all present when I lay emphasis on the great importance of keeping up the standards of the cause we all have at heart.

SERVICE.

Here we come to another important factor—that of service to the consumer, or (might I say?) dis-service. I would like you to meditate on the way in which the industry suffered during the great war, when a reduced quality of gas was rendered necessary by the extraction of benzole for the production of high explosives. It would be difficult to estimate the consumption of gas supplanted by electricity during this abnormal time; and it now lies in our hands to prove to consumers, by service, that the reduction of quality has since been righted, and so maintain our motto "Service."

Those undertakings which were situated in the air raid zones frequently had the greatest difficulty in supplying any gas at all, which naturally caused considerable annoyance to consumers, who as soon as possible embraced the opportunity of an alternative—viz., electricity. There is no denying the fact that we have a lot of leeway to make up; and as a member of the Council of the Institution of Gas Engineers, I am very pleased indeed to find this important matter is engaging their attention, inasmuch as we had a useful paper this year on "Service" by Mr. J. H. Canning, of Newport; and I understand that we are to have two further papers on the same subject at the meeting next summer.

One important side of service is maintenance. In Leeds, we

give free maintenance to the consumers; but only recently I have been convinced by the head of the Distribution Department that we are only just touching the fringe of maintenance. If this be true, then, from my own observations, some undertakings are far from even the fringe. This may be partly due to the fact that many places have not yet experienced severe electrical competition.

It would be as well, I think, to stress a few points which I consider to be most important to service:

The renewal of small service pipes.

The training of gasfitters to ensure the efficient fitting and adjusting of appliances.

Provision of showrooms where practical demonstrations are given.

Free maintenance. Material only to be charged for.

The encouragement of consumers to report faults.

Before I leave the subject of service, I would like to say that, through careful testing (both practical and laboratory) of some of the latest appliances, our Department has had to cease the purchasing of some appliances which appeared to be the last word in gas apparatus. As a consequence of this, not a single new type of appliance will be purchased in future in Leeds before it has been subjected to a most rigorous test. This we consider to be our duty to the gas-consuming public.

Finally, on the question of "Service," I feel it a duty to record the excellent work done for the industry by the officers and staff of the British Commercial Gas Association, who, I can honestly say, from my observations as a member of the General Committee, are striving harder than ever to see that gas has its proper place in the firmament of light, heat, and power.

Electrical Competition.

With State-aided super-power stations and the network of overhead distribution, there is no doubt that most other undertakings will have to meet and deal with competition such as that which Liverpool, Newcastle, and Leeds are at present experiencing. We have a vast amount of work ahead of us; and we must be sincere in our efforts if we are successfully to combat this powerful rival. In this city, competition is very severe, as will at once be seen by the fact that the total cost of manufacture and distribution for 1926 was 0·53d. per unit, while the average selling price over the same period was 1·34d. per unit. Gas will decidedly go on holding its own, even with electricity at the figures I have mentioned, provided it is manufactured at the right price, distributed at even pressures, and is of the right quality and composition, and if, by the best possible service, consumers are encouraged to use the commodity we have to offer.

Co-Operation.

For a considerable time I have cherished the idea that some sort of co-operation between gas managers might be of great service, particularly to small undertakings; and I am sure this could be carried out successfully, to the ultimate benefit of the gas industry as a whole. The larger works should assist the smaller ones by loaning experts from time to time, and by helping in cases of difficulty those undertakings who cannot regularly afford to employ experts. The smaller works, who would be unable to afford the whole-time services of a highly technical man, could well afford to pay for part-time assistance.

Coke Oven Gas.

Much more could be said on co-operation; and, to touch a further important side, I would like to see a closer bond between the gas industry and the coke oven industry. At present, the Institution of Gas Engineers is considering the question of extending its activities by opening its membership to men eminent in industry allied to ours; and here consideration might well be given to men of eminence and training in coke oven gas practice.

To the coke oven gas industry their coke oven gas is a surplus bye-product; and in the national interest it is deplorable that, in these enlightened days, gas suitable for town use should be burnt to waste. Our members will recollect seeing, on the occasion of our visit to the South Yorkshire Chemical Works, 4½ million c.ft. being wasted daily. This is only one instance of many which could be cited. In this respect it is to the credit of the "Gas World" that they have for some time past incorporated in their paper a very interesting section devoted entirely to coke oven gas practice.

Personally, I have no fear whatever for the future. I have watched with interest the progress made by the Junior Associations and the Education Scheme of the Institution of Gas Engineers, and I am confident that the type of man coming forward to the senior positions has had infinitely better opportunities. Provided the younger generation take advantage of the means of education afforded them, and they realize that their policy must be one of advancement, I think we may all rest assured of a bright future for the gas industry.

Discussion.

Mr. W. M. Carr (Stretford), referring to the point of free maintenance, said that, unfortunately, nothing was actually free, and gas undertakings had a great deal to do in the way of educating consumers in that direction. It was to be hoped the time was not far distant when the consumer would realize that, if he paid something for service, he could have his gas supplied at a lower price than was possible at present. It was stated in the "Gas Journal" recently that if the consumer paid 1s. per week he could have gas at 4d. per therm.* With a standing charge per consumer of approximately £2 10s. to £3 he could have that service. Their electrical competitors had introduced the Norwich system, and supplied power to consumers upon a system of charging on the basis of demand. He was convinced that gas undertakings would also have to charge their power consumers on a basis of demand. With a load spread over the 24 hours, with a good demand and a good load factor, they could afford to supply gas at a very low price in favour of the load. It behoved them all to give the matter the closest consideration. The National Gas Council were now at work endeavouring to establish a satisfactory basis. The public ought to be made aware that there were unprofitable gas consumers, such as the man who only spent (say) £2 per annum on gas. Such an individual was really receiving his gas for nothing.

Mr. F. H. Robinson (Harrogate) said that during the course of negotiations with an important power consumer, his authority found that their management and distribution charges amounted to 32s. 10d. per consumer. This showed that the average slot consumer was not a paying customer.

Mr. S. Shadbolt (South Bank) thought that the nature of the commodity they had to supply made it necessary to face the fact that they had to sell a certain amount of service with it. He did not think, however, it was wise to let people believe they were getting much for nothing.

Mr. R. Halkett (Sheffield) remarked that constant quality and pressure were leading factors in the problem of gas supply. The testing of appliances was another important point. As recently as the previous week, in Sheffield, two people were suffocated by gas owing to an appliance being fitted which the local authority would never have thought of supplying. Unfortunately, the appliance was sold by some outsider, and it was placed in a room without a flue and with very poor ventilation. At Sheffield they were keen upon using coke oven gas, and though having to face severe competition, gas was still maintaining its own against electricity, and was making progress. Sheffield had a differential rate of charge for large consumers, and in going through the consumption of a large consumer recently, he had found the average price worked out at between 1s. 3d. and 1s. 5d. per 1000 c.ft.; the first rate being 2s. 10d. He did not think the consumer sufficiently appreciated free service. In some cases the service was undoubtedly inadequate. When on a visit to some friends, a short time ago, he found they could not get a proper supply of gas when they lighted the gas cooker. He was not surprised at this when he discovered they had a 5-light meter with a ½-in. service and a ½-in. supply taken from the meter, and that there were in use three gas fires, a large gas cooker, and fifteen lighting units. By an expenditure of 30s. to £2, a good supply of gas could have been given to a very discontented consumer, who was eagerly looking forward to the day when electricity became cheaper.

Councillor E. J. Clarke (Chairman of the City of Leeds Gas Department) said that his Department was confronted with serious competition from electricity, which was also supplied by the Local Authority. One aspect of that competition included the supply of electricity upon a basis of rateable value, which in many cases worked out at a much cheaper rate for the consumer than through the ordinary meter. In addition, the Electricity Department had instituted a scheme which they called "The Assisted Wiring Scheme," which had undoubtedly brought about the supply of electricity as an illuminant in houses where gas had previously held the field.

Mr. E. H. Hudson (Normanton) thought it would be difficult in practice to allow members of staffs of large works to travel about the country giving advice to the directors of smaller undertakings which could not afford the expense of technical experts for themselves. Probably a better plan would be to establish technical branches and laboratories in the Universities of Leeds and Manchester, maintained by fees contributed from all the undertakings. Advice and assistance could thus be readily obtained by the smaller undertakings without encroaching unduly upon the good offices of the bigger undertakings.

Mr. A. L. Jennings (Cleckheaton) said it was important that the purchasers of tar and liquor should be given the qualities of those residuals which they required, and not those qualities which gas undertakings in some cases wished to supply. In certain instances coke oven installations could supply as a residue the surplus gas they produced, while at the same time they produced coke to sell to customers who were formerly supplied by gas undertakings.

Mr. W. J. Smith (Bolton) was of opinion it did not matter how maintenance was paid for.

Mr. S. Meunier (Stockport) suggested that members might take into consideration whether free service, so-called, was or was not paid for out of the gas. In Stockport it cost £700 per annum to carry out free service, but as a credit against it the amount of goods and appliances sold showed over £1000 profit in two years. The question of differential prices should have careful consideration. In Stockport the heavy domestic consumer was receiving a rebate, with the result that appliances were being installed in houses because the gas was cheap.

Mr. R. H. Ginman (Leek) pointed out that there was no penalty attached to a drop in electrical pressure, while there was in the case of gas. If there was a two or three hours' failure of electricity

* Apparently the reference is to an extract (published on p. 476 of the "Journal" for Nov. 16) from a letter by Mr. George Helps in the "Midland Daily Tribune" for Nov. 11. A comment upon this is made by "Engineer" in our Correspondence columns this week.

supply in a busy shopping or industrial centre, no redress could be obtained.

The PRESIDENT then briefly reviewed the discussion.

DRY OXIDE PURIFICATION.

Mr. J. W. THOMPSON, of Barnoldswick, then read a paper on "Dry Oxide Purification," the discussion upon which was deferred until a later date. The paper will be published in a subsequent issue of the "JOURNAL."

The proceedings then closed.

CITY OF LEEDS GAS DEPARTMENT.

The Corporation acquired the gas undertaking from the Leeds Gas Lighting Company and the Leeds New Gas Company in 1870, at a cost of £763,224. Since that date considerable sums have been spent on capital account; and the total capital expenditure, including the purchase money for the undertaking, up to March 31, 1927, was £2,842,493.

Since the last visit of the Institution, the Meadow Lane Works have been entirely re-modelled; the whole of the carbonization now being by up-to-date vertical retorts, with the necessary coal breaking, elevating, conveying, and coke handling plant. The result is that the plant is almost automatic in action. The coal after it leaves the wagons is never handled until it is discharged as coke into the bunkers. Many improvements have also been made to the carburetted water gas plant; the generators in two of the machines having been renewed and enlarged, while a complete new set (capacity 1½ million c.ft. of gas per day) has been installed.

In addition, a supply of coke oven gas, amounting to over 300 million c.ft. per annum, is dealt with at these works. The gas is purchased from the Middleton Estate and Colliery Company, and was formerly allowed to burn away at the coke ovens. By the utilization of this gas, the Committee are assisting in the conservation of coal, which is of national importance.

The New Wortley Works have also been greatly improved by the introduction of electric telphers and coke handling and screening plant; while the retorts in No. 2 retort house have been completely demolished and rebuilt to entirely new designs, with the result that the yield of gas from this plant has been increased by over 1 million c.ft. per day. The cellars have also been widened and properly ventilated, which has considerably improved the working conditions of the men employed.

The inclined retorts have been reconstructed; and the capacity of this retort house has also been increased by over 1 million c.ft. of gas a day.

During the war, a plant was installed by the Government for the abstraction of benzole and toluole from the gas, for the manufacture of high explosives; and no less than 750,000 gallons of benzole and toluole were extracted for this purpose. This plant was purchased in 1919 by the Gas Committee, for the production of motor spirit; and it has proved to be a very profitable investment.

Owing to the development of the city, and particularly in connection with the housing schemes, the activities of the Distribution and Meter and Stoves Departments have been greatly intensified. Many new trunk mains have been laid to ensure an adequate supply of gas to the outlying districts; while the increasing popularity of gas as a fuel is shown by the extraordinary demand for gas appliances of every description. To meet this demand, a 12-in. high-pressure main has been laid from the Sheepscar gasholder station to Moortown.

In October, 1909, that portion of the Meadow Lane Works occupied by the Meter and Stoves Department was gutted by fire; and as the premises had not been suitable, the Committee decided to erect new workshops on a site 3206 sq. yds. in extent, in Sovereign Street. These premises are fitted up with the necessary plant for the repairs of meters, stoves, cookers, fires, hot water apparatus, and other gas appliances. In addition, a meter testing room is provided, and a mechanical spraying plant has been installed which has been the means of great saving in the cost of paint and labour. The general stores are also housed here.

The area of supply has been considerably extended by the purchase of the Crossgates, Halton, and Seacroft gas undertaking, and also the area within the city boundary in the parish of Adel-cum-Eccup, which had previously been supplied by the Calverley and Horsforth Gas Company. Further to show the progress and advancement of the Department, it may be pointed out that in 1906, the date of the last visit, the quantity of gas manufactured was 3,100,714,000 c.ft., as compared with 3,137,367,000 c.ft. in 1918 and 3,495,589,000 c.ft. in 1927; while the quantity of gas sold was 2,795,122,000 c.ft. in 1906, 2,872,142,000 c.ft. in 1918, and 3,277,694,000 c.ft. in 1927.

The gas sold per ton of coal carbonized in 1870, when the Corporation acquired the undertaking, was 6960 c.ft., as compared with 9450 c.ft. in 1906, 9845 c.ft. in 1918, and 13,802 c.ft. in 1927, or an increase of 98 p.ct. Although the quantity of gas sold during the year ended March 31, 1927, was a record, the coal used, notwithstanding the greater output of gas, was only 237,468 tons, as compared with 292,800 tons in 1906—a decrease of 55,332 tons. Or to put it in another way, if the gas sold per ton of coal carbonized in 1927 had been the same as in 1906, 346,845 tons would have been used—a difference of 109,377 tons during the year, clearly justifying the installation of more modern methods of carbonization and the general improvements at the works.

The following figures are for the year ended March 31, 1927: The total number of meters in use was 129,468, as compared with 112,958 in 1906, and 58,700 in 1871; the number of prepayment meters 66,098, against 34,379 in 1906; and the number of stoves 38,566, as against 15,979 in 1906.

Formerly it was not the practice of the Committee to supply gas heating appliances on simple hire terms; and it was not until 1915 that this system was adopted. At first, the progress made was slow, owing to the restrictions enforced during the war. Since 1918, however, an intensive propaganda has resulted in the extended use of all descriptions of gas appliances. The number of gas fires on March 31 last was 16,480, radiators 2238, other appliances 2065, and lighting fittings and brackets 45,816.

In order to develop the sale of gas for industrial and commercial purposes, a Furnace Department has been opened at Dewsbury Road. A demonstration room has been fitted-up with the most modern types of furnaces for the heat-treatment of metals. This room is much appreciated by prospective customers; and demonstrations are given of the particular process in which they are interested. The efforts in this direction have resulted in a largely extended use of gas as a fuel for commercial purposes.

The total length of mains in the area of supply is 1098 miles, which is the greatest mileage in the kingdom, except London, Glasgow, and Birmingham.

The present capacity of the whole of the gas-works is 17,500,000 c.ft. per day; while in addition a supply of coke oven gas is received from the Middleton Estate and Colliery Company, of approximately 1 million c.ft. per day.

The prices charged for gas from the last meter reading in September are:

Gas Consumed on One Premises per Quarter.	Per 1000 C.Ft.	Per Therm.
	s. d.	d.
For lighting, cooking, heating, &c.:		
Under 100,000 c.ft.	4 2	10·64
100,000 and under 300,000	4 1	10·43
300,000 ,, ,, 500,000	4 0	10·22
500,000 ,, ,, 750,000	3 11	10·00
750,000 ,, ,, 1,000,000	3 10	9·79
1,000,000 ,, ,, 2,500,000	3 9	9·58
2,500,000 and upwards	3 8	9·36
For motive power and furnace work:		
Under 100,000 c.ft.	3 5	8·73
100,000 and under 300,000	3 3	8·30
300,000 ,, ,, 500,000	3 2	8·09
500,000 ,, ,, 750,000	3 1	7·88
750,000 ,, ,, 1,000,000	3 0	7·66
1,000,000 ,, ,, 2,500,000	2 11	7·45
2,500,000 ,, ,, 4,000,000	2 10	7·24
4,000,000 ,, ,, 5,500,000	2 9	7·02
5,500,000 and upwards	2 8	6·81

Gas for Furnace Work.—This includes tool and case hardening, metal melting, annealing, forging, hardening, tempering, crucibles, muffles, glass industry, sugar boiling, fish frying and baking (with approved furnace burners), and high-power air blast burners.

The gas for these purposes must be registered through a separate meter, and a charge is made for meter rent and for work done in fixing meter and alteration to such supply.

Discount.—The above prices are subject to a discount of 5 p.ct. if the account is paid within one month from date of delivery.

Scale of Charges for the Supply of Gas through Prepayment Meters.

—	Per 1000 C.Ft.	Per Therm.	C.Ft. per Penny.
	s. d.	d.	
Gas supplied through prepayment meter without stove or fittings	4 2	10·64	20·0
If unpacked slot cooker is supplied	4 5	11·28	18·9
If packed cooker is supplied	4 8	11·92	17·8
If a gas fire is supplied	4 8	11·92	17·8
If ring burner, one drop-pendant and two brackets are supplied, but without cooker	4 8	11·92	17·8
If a packed cooker and one gas fire are fitted in sitting room	4 10	12·34	17·2
If with two gas fires	4 11	12·55	16·9

CARBONIZING PLANTS.

NEW WORTLEY WORKS.

No. 1 Retort House.

This retort house is 340 ft. long by 68 ft. wide. Gas manufacture was commenced in it in 1880; and for sixteen years hand stoking was the vogue. There were 26 beds of six direct-fired retorts, and 6 beds of eight on the regenerative principle in three benches, a total of 204 through retorts, all 20 ft. long.

In 1896, compressed air stoking machinery was installed by West's Gas Improvement Company. The installation comprised three steam driven cannel breakers, elevators, and belt conveyors, two charging and two drawing machines driven by compressed air at a pressure of 65 lbs. per sq. in., and six 10-ton overhead coal bunkers. All the coke was removed in small one-wheel iron barrows by manual labour. Cannel was used in this house, to maintain the illuminating power of the gas.

No. 2 Retort House.

This house is 340 ft. long by 86 ft. wide. Gas manufacture was commenced in it in 1885; and until the end of 1896 the stoking was done by manual labour. Messrs. Sir Wm. Arrol & Co.'s system of hydraulic stoking machinery was then introduced, consisting of four charging and four drawing machines. Two steam-driven coal breakers and elevators and a 20-ton coal bunker were installed. The coke was drawn into small one-wheel iron barrows, and taken into the yard by manual labour. In 1913-14, two hydraulic discharging machines were installed, displacing the four drawing machines. Twelve-hour charges were commenced; and the coke was discharged into large two-wheel barrows at one side of the bench only.

In 1915, four hydraulic wagon tippers were added to the equipment of the house. In 1916, electric telpherage and coke screening plant was installed, comprising a low-level track with two telphers and large tipping skips in the house, slaking tank, coke screens, skip pit with automatic skip loading devices, a high-level track with two telphers and skips, overhead bunkers capable of holding 300 tons of coke, and a track 300 ft. long under which 6000 tons of coke can be stored.

There are 27 beds of eight retorts, each 20 ft. long, in three benches, on the regenerative principle. All the retorts (216 throughs) are working at present, and are manufacturing approximately 4,000,000 c.ft. of gas per 24 hours of 470 B.Th.U. value.

No. 3 Retort House (Inclines).

This house, built in 1903, is 290 ft. long, 70 ft. wide, and 55 ft. high from yard level to eaves of roof. The installation comprises two coal receiving hoppers, duplicate sets of 40 tons per hour coal breakers, elevators, push-plate conveyors, and overhead bunkers capable of holding a 24-hours' supply of coal. The whole of the coal handling plant is driven by 70-B.H.P. "National" gas engines. Attached to the overhead coal bunkers are the measuring chambers, by means of which charges of coal varying in weight from 4 to 7 cwt. can be placed in the retorts. The coal is delivered into the retorts from the measuring chambers by charging chutes, which run along rails from bed to bed.

There are two benches of retorts, each containing eleven beds of eight on the regenerative principle, a total of 176 through retorts. The retorts are set at an incline of 32° to the horizontal, and are 20 ft. long. There are two chimneys, each 120 ft. high, one for each bench of retorts. The No. 1 bench was pulled down and rebuilt to an entirely new design in 1924-25; and No. 2 bench has been dealt with in the same way this season.

MEADOW LANE WORKS.

In 1913, the Committee decided to erect one bench of intermittent Dessau vertical retorts; and another bench of the same type was erected in 1915. In November, 1920, borrowing powers were obtained for the erection of an installation of continuous vertical retorts; and contracts were placed with Messrs. Robert Dempster & Sons, of Elland, for the erection of coal and coke handling plant and an installation of Dempster-Toogood vertical retorts (2½ million c.ft. capacity per diem), and with West's Gas Improvement Company, for an installation of Glover-West vertical retorts of similar capacity. The cost of the combined plant was £244,024.

Dessau Vertical Retort House.

This house is 100 ft. long, 92 ft. wide, and 48 ft. high from yard level to eaves, and contains five beds of Dessau retorts, each comprising eighteen 4-metre retorts, together with the usual auxiliary coal and coke handling plant. The plant was duplicated in 1915; and the capacity of each bench of retorts is 1,000,000 c.ft. per day.

Continuous Vertical Retort House.

The house is a steel framed building with 4½-in. brick panelling, and contains the following plant:

There are nine settings of Glover-West vertical retorts containing 72 33-in. retorts, carbonizing 180 tons of coal per diem. The installation is complete with waste-heat boilers, and the producers are of the step-grate type.

There are nine settings of Dempster-Toogood vertical retorts. These settings are now under reconstruction, and will be built entirely of silica material.

Each plant is equipped with an electric lift to all floors. The total capacity of the carbonizing plant at these works is 7 million c.ft. per day.

Coke Handling Plant.

The coke handling plant and storage bunkers were erected to deal with the coke from both benches of continuous vertical retorts. Each system of verticals is circumscribed by its own gravity bucket conveyor; the top strand delivering coal to the bunkers, and the bottom strand taking coke from the retort house to the screens. Screening is effected by rotary screens; and the plant is duplicated and provided with change-over facilities, so that the coke from either vertical plant can pass through either set of screens.

The telpher plant is of the mono-rail type; and the three machines are by Messrs. Strachan & Henshaw, Bristol. Each machine is equipped with a 5-H.P. travelling motor, and a 12-H.P. hoisting motor. The plant is so arranged that any grade of coke can be taken from the storage bunkers and deposited by the telpher at any point in the coke yard. This plant also deals with the coke from the Dessau retort house. The length of telpher track is 530 yards, and the height is 33 ft.

Carburetted Water Gas Plant.

This plant is capable of producing 5½ million c.ft. of gas per day, and consists of four units: Nos. 1 and 2 sets, by Messrs. Davison & Partner, London. Capacity of each, 1½ million c.ft. per day. No. 3 set, by the Economical Gas Apparatus Construction Company, Ltd., Westminster. Capacity, 750,000 c.ft. per day. No. 4 set, by Messrs. Humphreys & Glasgow, London. Capacity, 1½ million c.ft. per day.

In addition, a supply of coke oven gas is obtained by means of a high-pressure main from the Middleton Estate and Colliery Company. The gas after being measured mixes with the carburetted water gas stream at the inlet to the exhausters.

YORK STREET WORKS.

These works are the smallest and the oldest in the city; gas having been made here since the year 1818 or 1819. They were taken over by the Corporation in 1870, and since then have been entirely re-modelled. The old system of hand stoking was in vogue until the year 1902, when the present inclined retort

[*Pickard, Photo, Leeds.*

OUTSIDE THE LEEDS TOWN HALL.

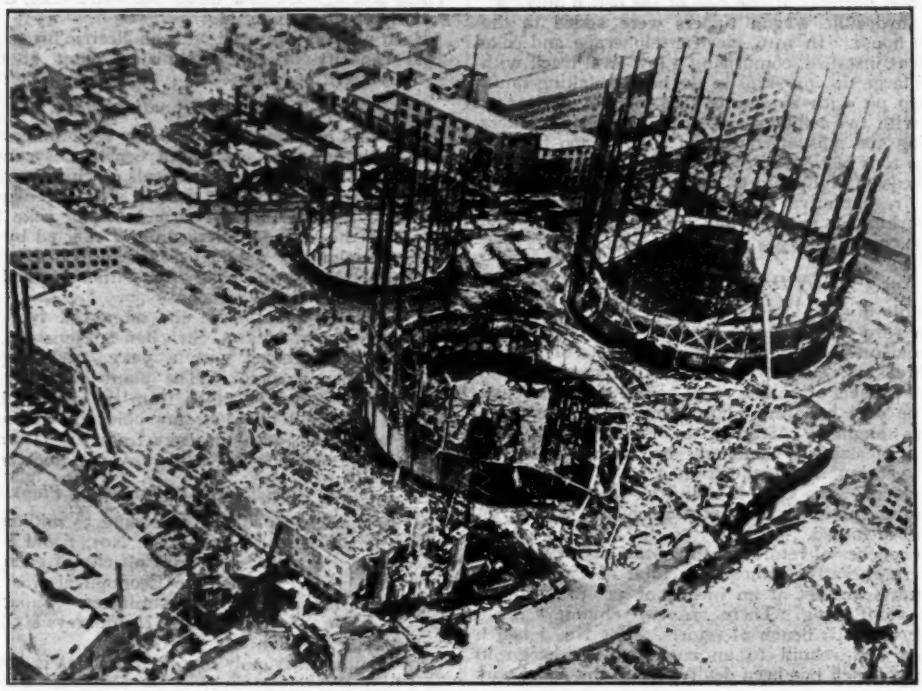
installation was erected. The whole of the coal used here is now carbonized in inclined retorts which were last re-set in 1919; and beyond the usual expenditure in repairs to maintain the efficiency, nothing has been added to the plant. Unlike the New Wortley and Meadow Lane Works, there is no direct railway communication; consequently all the coal and other materials are road borne. Until October of this year these works have been closed-down since 1923, when the vertical retort installation at the Meadow Lane Works commenced gas making. The whole of the plant (with the exception of the retorts, which were only patched) has been completely overhauled.

Installation of Inclined Retorts.

This retort house is 156 ft. long, 70 ft. wide, and contains a single bench of 12 settings of eight retorts, the dimensions of which are 24 in. by 15 in. at the bottom, tapering to 20 in. by 15 in. at the top, 20 ft. in length, and set at an angle of 32° to the horizontal. The furnaces are on the regenerative principle, of a tubular design, with step-grate producers, built level with the ground floor.

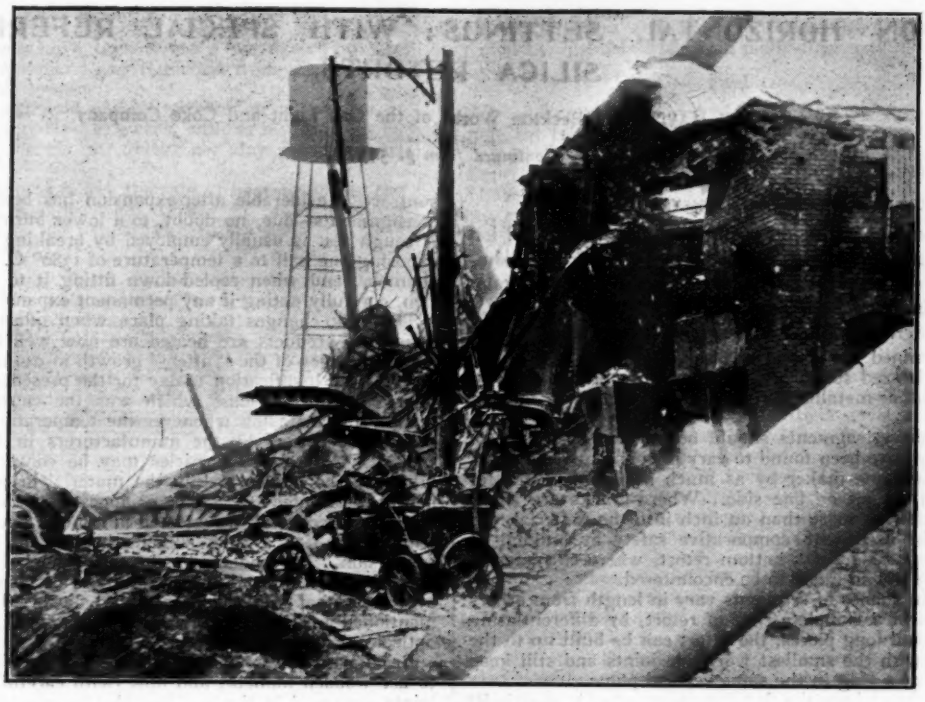
The coal is charged into the retorts by means of iron chutes, three to each set for the different levels of retorts, and is discharged as coke from the drawing stage, running the full length of the house. Coal is tipped into the receiving hopper, elevated to the top of the house, and delivered into an 18-in. push-plate conveyor, which distributes it evenly over the whole length of the storage bunkers, which are supported on the superstructure of the bench. The bunkers are 139 ft. long, 6 ft. wide, and 7 ft. deep, with a capacity of 140 tons.

THE GASHOLDER DISASTER AT PITTSBURG.

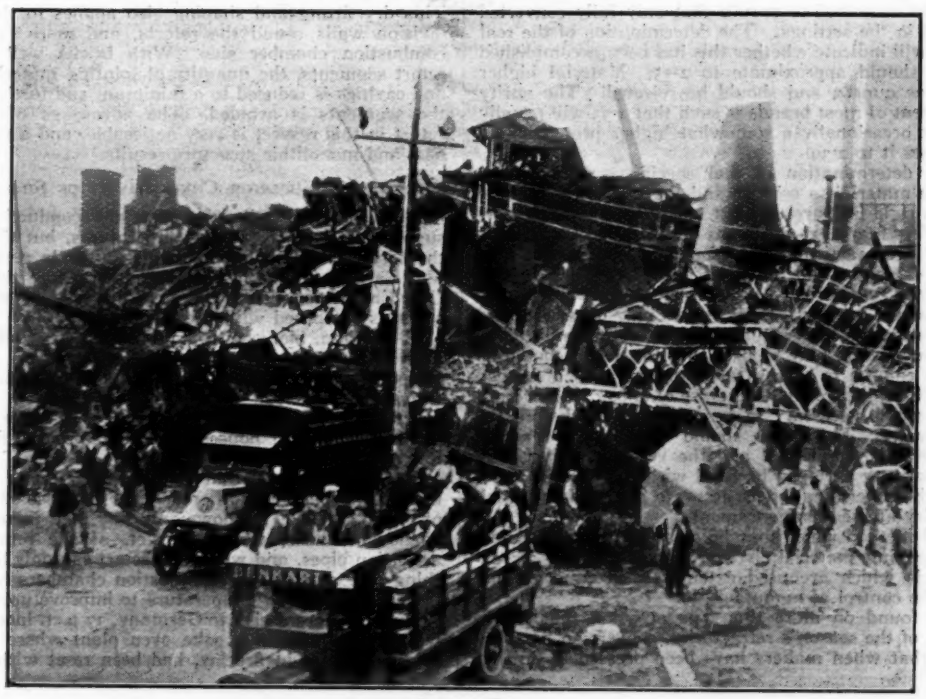


AERIAL VIEW OF THE DESTROYED HOLDERS.

A FACTORY WRECKED BY THE EXPLOSION.



A JUMBLE OF TWISTED STEEL AND IRON.



AFTERMATH OF THE PITTSBURG GAS TANK DISASTER.

Wreckage at the Pittsburg Clay Pottery Works—the factory where the death toll was highest.

Liquid Purification in Texas.

According to a report which has appeared in the pages of the "Gas Age-Record," the first liquid purification plant to be installed in Texas for removing hydrogen sulphide from natural gas was put into operation early last August. It was designed and manufactured by the Koppers Construction Company, of Pittsburg, and erected on the Gulf Production Company's lease in Crane County. Although liquid purification has been used for treating natural gas in the Canadian fields, this installation is unique, because of the high hydrogen sulphide content of the gas produced in the Crane County field. The inlet gas to the absorber contains approximately 11 p.ct. hydrogen sulphide by volume (7000 grains per 100 c.ft.). When operated at rated capacity, the outlet gas contains approximately 0·15 p.ct. (95 grains per 100 c.ft.), which represents a removal efficiency of 98·6 p.ct. The plant is designed for operating under a maximum gas pressure of 30 lbs. per sq. in. The purified gas is being used by the Gulf Production Company as fuel in engines driving direct-coupled air compressors. By utilizing purified gas, long life for the engines and continuous operation will be ensured. The hydrogen sulphide is removed by scrubbing the gas with a dilute solution of sodium carbonate, which is subsequently revivified by aeration and recirculated in the absorber. The system is known as the Koppers Company's "Seaboard" process.

NOTES ON HORIZONTAL SETTINGS: WITH SPECIAL REFERENCE TO SILICA RETORTS.

By STEPHEN HAY, of the Beckton Works of the Gas Light and Coke Company.

(*Continued from p.* 543.)

SUPERVISION DURING CONSTRUCTION.

The importance of inspection of material and the supervision of bricklayers cannot be over-estimated; and a surprising number of failures (sometimes serious) can result from the cumulative effects of indifferent material and slipshod workmanship.

All silica material, and especially retort segments, should be separately examined for cracks and segregation of iron in the form of brownish-red spots, probably due to iron compound in the raw material or metallic iron from the milling and crushing plant.

Where necessary, segments should be stacked according to length, for they have been found to vary in consecutive consignments from the same maker by as much as $\frac{1}{16}$ in. Doubtful segments must be put on one side. Where cracks are slight and do not penetrate more than an inch into the material, the segment can be used with comparative safety by building it into the waste gas side of a bottom retort, where extremes of temperature are not so likely to be encountered.

Where certain shapes of segments vary in length from others necessary to form a complete ring of retort, by differentiating between short and long pieces, the retort can be built up to the correct length with the smallest workable joints and still keep the butt joints of a ring in the same vertical plane.

In a recent case where the flat floor segments (A, sketch B) were all on the short side, an inch split was inserted between segments on the fourth cross wall on both sides of the setting, with no ill effects.

Representative samples of material from each delivery should be systematically examined to ensure that only fully converted material is used in the settings. The determination of the real specific gravity will indicate whether this has been accomplished completely. It should approximate to 2·35. Material higher than 2·4 contains quartz, and should be rejected. The purity and heat treatment of most brands is such that 2·33 will usually be reached; but occasionally a somewhat higher proportion of alumina increases it to 2·39.

The classical determination of real specific gravity by the reduction of the material to powder and the use of the specific gravity bottle is rigid in its results but troublesome and lengthy in operation. Very many examinations of divers silica materials prove that they are practically free from enclosed pores. The determination of weight and apparent porosity (which in this case coincides with real porosity) will therefore give, by calculation, the real specific gravity. Both figures may be ascertained speedily if appropriate porosity apparatus is at hand. The water absorption method may be used, but the vessel should be of metal, large enough to take a whole brick, with a flanged lid heavy enough to dispense with the use of clips. A mechanical vacuum pump is necessary to evacuate the air before the admission of water. The pump should continue to function until the material is submerged and the vessel filled. Under these conditions every pore can be filled with the fluid in a few minutes, and the determination is accurate provided the brick is thoroughly dry at the commencement.

A more rapid method which may be as accurately performed, suitable for checking material, is one or other of the air expansion methods which are used extensively in America and Germany for the control of manufacture.

It has been found on more than one occasion that in the early deliveries of the season's refractories, conversion has been complete, but that when makers have been pressed to finish a contract, considerable after-expansion has been found in later consignments—due, no doubt, to a lower burning temperature. A rough test is usually employed by breaking a brick in half, exposing one half to a temperature of 1380° C. in a combustion chamber, and when cooled-down fitting it to the unfired portion, carefully noting if any permanent expansion has occurred.

The bulk changes taking place when quartz and its transformation products are heated are now well known; and the one-time bogey of the "after" growth in use may be banished. There is no justification to-day for the presence of unconverted quartz in silica bricks, which was the cause of subsequent permanent expansion whenever the temperatures employed exceeded those used by the manufacturers in the range below 1400° C. All quartz particles may be converted if steps are taken by the maker to kiln the material at a minimum temperature of 1430° C. There appears to be no reason to anticipate technical troubles in attaining and exceeding this temperature for a time sufficiently long to ensure complete conversion. In modern gas-heated tunnel kilns, the whole operation is completed with very slight losses due to collapse or by rejection of materials containing flaws. The temperatures mentioned are those read by sighting the work with a reputable optical or radiation pyrometer.

Bricklayers dislike thin joints, but they have been encouraged to use wooden mallets; and now (with careful inspection) $\frac{1}{8}$-in. joints are usual in the well-moulded segments, while in others a certain amount of "rubbing-down" has to be resorted to, to ensure a good fit. Men should be trained to fit segments before jointing, as the exchange of one tile often makes all the difference between a neat compact ring and a loose uneven one. This dry fitting and shaping also applies to the bricks in the division walls round the retorts, and more especially on the combustion chamber side. With bricks well shaped to the retort segments, the quantity of jointing material to fill spaces and cavities is reduced to a minimum and further movement of the segments is avoided. The advantage of the "square" retort in this respect is very noticeable, and a much more compact and monolithic structure results.

SUPERIOR CONDUCTIVITY OF SILICA.

It is sometimes disputed that the conductivity of silica is superior to fireclay at low temperatures, but the superiority of the former at carbonizing temperatures is generally accepted. Mr. Carmichael, in his recent paper before the Institution of Gas Engineers, claims 30 p.ct. increase in throughput with silica as compared with fireclay.

At Beckton, along with the introduction of silica, other modifications in carbonizing plant have been made, and it is rather difficult to give a definite figure; but it is believed that the throughput has been increased by over 20 p.ct., due to silica.

Table C shows a comparison between silica and fireclay in three of the retort houses. In each case the figures represent four weeks' working.

No. 1 House shows an increase of 45 p.ct.; but in this case the stoking plant was altered. No. 7 House shows an increase of 17·3 p.ct. No. 12 shows only 15·7 p.ct. increase; but in this particular house, where 80 p.ct. of the retorts have single ascension pipes, and where the retort can only be filled to something over 50 p.ct., the combustion chambers have to be maintained at too low a temperature to improve upon this figure.

During a recent visit to Germany, 17 p.ct. increase in throughput was claimed in a coke oven plant where the oven walls, originally built in fireclay, had been reset with silica; the flue

TABLE C.

	No. 1 House.		No. 7 House.		No. 12 House.	
	1926. Silica.	1924. Fireclay.	1925. Silica.	1922. Fireclay.	1926. Silica.	1922. Fireclay.
Total gas made, thousands	156,347	108,501	176,674	137,397	198,992	163,569
Calorific value, B.Th.U.	554·7	557·9	544·7	540·2	536·0	523·5
Therms made	867,308	605,309	962,280	742,250	1,066,594	856,340
Coal carbonized, tons	12,110	8,668	13,375	10,805	14,838	12,469
Make per ton, c.ft.	12,911	12,518	13,209	12,716	13,411	13,118
Therms per ton	71·62	68·83	71·95	68·69	71·88	68·68
,, ,, retort	118·03	79·12	134·08	109·08	98·40	81·04
Weight per charge, cwt.	14·46	11·48	18·74	16·32	12·10	10·43
Throughput per diem ,,	32·96	22·66	37·27	31·76	27·38	23·67
Duration, hours	10·53	12·16	12·07	12·33	10·60	10·58
Temperature combustion chambers, °C.	1366	1334	1383	1409	1332	1270
Cost per ton, pence	20·61	23·86	19·84	22·29	22·49	25·36
,, ,, 1000 c.ft. ,,	1·60	1·90	1·50	1·75	1·68	1·94
,, ,, therm ,,	0·29	0·34	0·28	0·32	0·31	0·37
Percentage, full	68	47	67	58	50	43
P.Ct. increase in throughput	45·4	..	17·3	..	15·7	..
Age in days	404	1877	593	250	800	1985

temperature being the same in both cases. In Germany, horizontal retort segments have been made 2 in. thick; but the writer would not recommend any reduction from the standard 3 in. thickness in this country.

Perhaps the best example of high production with silica at Beckton is No. 4 Retort House, where, with 22 in. by 16 in. by 20 ft. retorts, 120 therms per retort per day is considered average working.

Attempts were made to follow the rate of heating within the charge, and Chart F shows the average of many readings taken. After 2½ hours the temperature rise is regular, and is about 30° C. per hour.

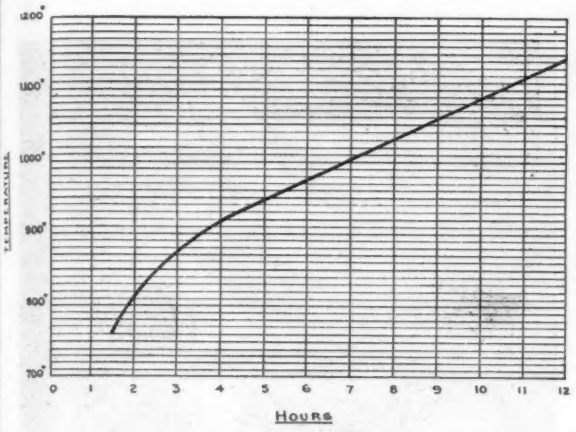


Chart F.—Showing rate of Heating within Charge.

Chart G shows the temperature within the retort at varying distances.

Greater Flexibility with the Use of Silica.

Atmospheric conditions have an enormous influence upon the consumption of gas; and it may be interesting to mention that in the Gas Light and Coke Company's area, one degree Fahrenheit rise or fall in the average daily temperature means, roughly, a difference of 1¼ million c.ft. Usually the load is balanced by water gas, but, when circumstances demand, the coal gas make is varied.

In December last year Beckton produced its maximum day's make of 106 million c.ft.; and Table D illustrates the flexibility of silica, when, without fear of damaging retorts and settings, the temperatures were increased and the duration of charge reduced, resulting in an increase from 106·7 to 120·5 therms per retort per day.

The reduction of make is as easily effected. With reduced temperatures, a retort house may be allowed to stand for 8 hours or even 16 hours, though in houses where waste-heat boilers are fitted it is preferable to work alternate 8-hour shifts in order to feed producers. Sometimes temperatures are reduced to suit 24-hour charging; but much depends upon the schedule of labour needed and the size and suitability of the unit.

With silica, it might be a decided advantage to consider reduced temperatures and longer duration charges in the summer months, instead of shutting plant down entirely.

Care of Silica.

With care, silica material of the right type may be heated through the critical range, about 230° C., without the breaking of its grain bond and without movement beyond the inevitable uniform increase in bulk; but uneven or too sudden heating will have disastrous effects. Efforts should be made at these early stages to secure an adequate flow of gases through the setting, to raise the temperature of all parts simultaneously. When the temperature has passed 500° C., there is little to fear in the very slight expansion that ensues to 1400° C.; and the temperatures may suffer wide fluctuations without danger to the structure. It is not sufficiently well recognized that the splintering of silica plunged into hot zones is confined to the changes at the lower temperatures about 230° C.; but the importance of this points to the course that must be followed if silica retorts are to be successfully patched with silica material. The provision of small ovens fitted with a governed system of heating enables the bricklayers to heat the patching mass slowly up to 300° C., when it can be dipped into a mixture of molten pitch and finely ground silica, and pressed into place. Chart H shows the temperature in a setting being cooled down, and Chart J shows the temperature during heating up after resetting. Where corrugated strips of paper or wood are nailed to the pier walls, to allow for expansion, the nails should be accounted for when the setting is completed, and, before the drying and heating process begins, combustion chambers should be thoroughly brushed out and retorts inspected for bolts, &c., which may be left by the men erecting the bench fittings.

It appears that the more porous the material, the greater are the slag penetration and the effect of volatile iron attack. An experiment in which similar sized bolts were placed upon silica bricks of 37 p.ct., 33 p.ct., 27 p.ct., and 22 p.ct. porosity, and fired in a combustion chamber, proved conclusively that the damage was greatest in the more porous bricks. A clean hole rather larger than the contour of the bolt was cut completely through the brick of 37 p.ct. porosity; only the head had succeeded in penetrating to the underside of the brick of 22 p.ct. porosity, and the cross-section of the area of penetration was less. The lower the porosity, the stronger is the material.

It has been said that low porosity is undesirable because it increases spalling. One kind of spalling is caused by too rapid heating or cooling in the range 0° to 300° C. Provided the rate is slow enough, there appears to be no difference between bricks of 22 p.ct. and 39 p.ct. porosity, and above 500° C. there cannot be any difference between them. Another kind of spalling is associated with the scurfing of retorts. When the layers of carbon are detached, lumps of silica, in some cases an inch thick, have been torn from the sections, and found closely held by the carbon. This occurred to such an extent with highly porous material as to become disquieting. The effect is not appreciable with silica round 27 p.ct. porosity, and it has not been noticed with silica of 22 p.ct. porosity. Retorts of the latter type scurf easily and readily.

Silica should always be stored under cover. A disused retort house provides storage at Beckton; and in the same building arrangements have been made for the installation of pan-mills for the preparation of jointing cement.

Failures.

In all his experience with silica in retort settings, the writer has not seen a failure which could be attributed to high-temperature working, whereas he has witnessed many instances of

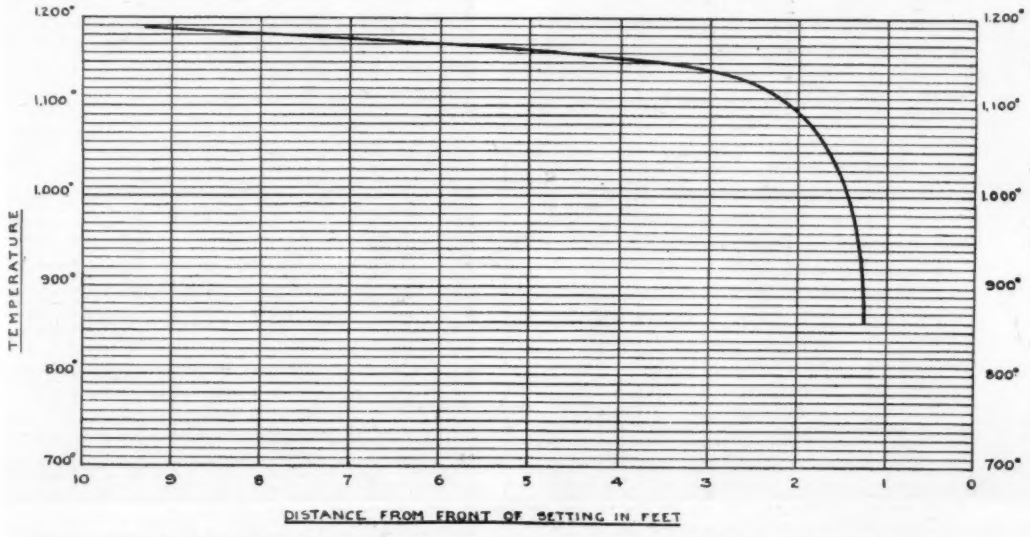


CHART G.—SHOWING TEMPERATURE WITHIN RETORT AT VARYING DISTANCES.

TABLE D.

1926.	Make Thousands.	Retorts.			Allocation of Work.						Average Duration Hours.	Average Combustion Chamber Temperature.		B.Th.U.	Make per Retort C.Ft.	Therms per Retort.
		In Action.	Charged.	Charges.	8-Hour.		10-Hour.		12-Hour.			Fire Side.	Blank Side			
						P.Ct		P.Ct.		P.Ct.		Deg.	Deg.			
December 16 .	58,419	2907	2877	6255	432	7	2300	37	3523	56	11·04	1359	1360	531·4	20,095	106·7
December 17 (Day of maximum make)	71,936	3180	3174	7485	3162	42	1906	26	2417	32	10·18	1373	1378	533·1	22,621	120·5
Increase, p.ct. .	23	..	10·3	..	..	..	..	..	..	..	..	..	..	..	12·6	12·9

the softening of fireclay and siliceous material. The failure of silica is always due to some other cause, as:

(1) Faulty design in setting.
(2) Mechanical crushing by stoking plant.
(3) Inferior jointing cement.
(4) Patching with fireclay or siliceous material.
(5) Iron attack.

From the first introduction of silica in combustion arches and division walls, the individual bricks have always been found in perfect condition. With this knowledge, the opinion was voiced years ago, though without proof, that attack on silica retorts was from the inside.

In an endeavour to fathom the sequence of changes which occur in the progressive holing of silica retorts, a considerable amount of work has been done by Mr. A. Edwards, Works Chemist, who has gone into the subject thoroughly from the chemical and physical standpoints. His work is extremely valuable; and with his permission the information is added as an appendix to these notes.

As far as the writer is aware, previous examinations have only been made when the damage was complete, and when the patching operations had caused general spreading from the original source. The "frightfulness" observed on the outside of the retort and adjoining areas was to many a stumbling block to the acceptance of the inside attack theory in its entirety. Figs. 3 and 4 show the damage spreading.

It was considered necessary to track-down such examples as would serve to show the result of attack in its earliest stages; and to this end, retorts have been under minute observation. There has been no hesitation in putting settings out of action so that representative sections could be cut out to demonstrate the character of the attack before complete perforation had obscured much of the evidence.

That there is no attack on silica from flue gases, the writer is convinced from the many settings inspected; but he has seen ample evidence of this attack on fireclay and siliceous retorts and walls.

Popular opinion has made much of the slagging action of dust in producer gas from inside producers; and claims are made for the longer life of refractory materials fired with washed producer gas. Where the surfaces are wholly fireclay or contain a substantial proportion of fireclay, washed producer gas is a benefit. In a special setting at Beckton, siliceous retorts were built in one tier, and silica retorts in the other,

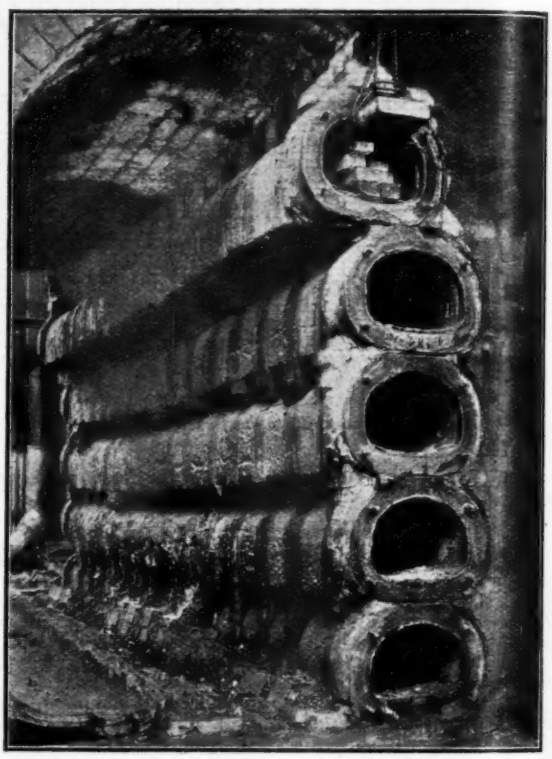


Fig. 1.—No. 8 Retort-House—View of Right-Hand Retorts (No. 27 Set taken on West Side).

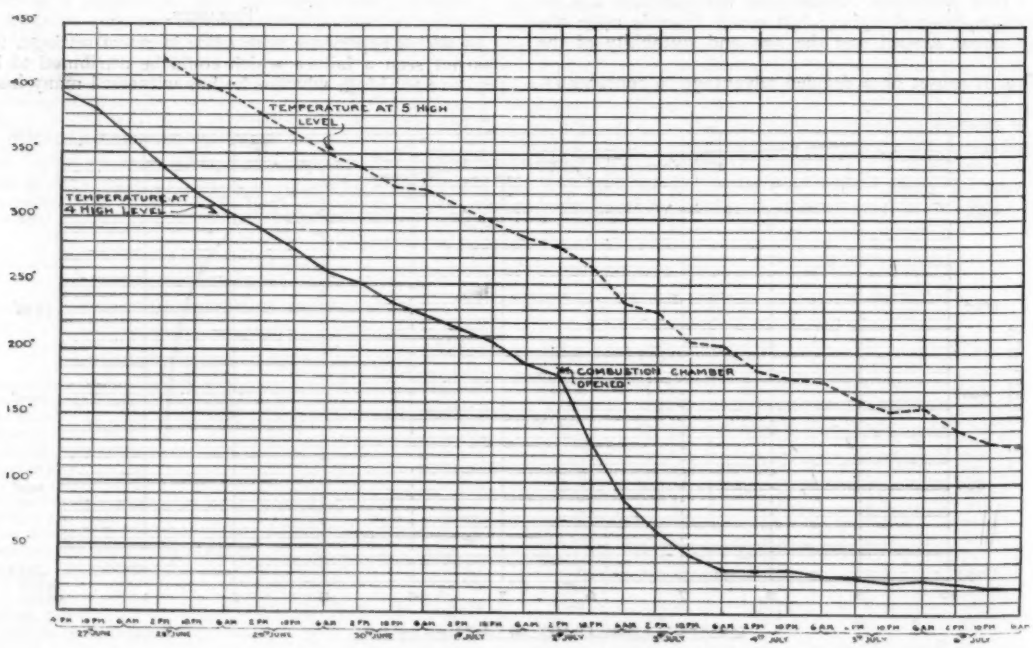


CHART H.—SHOWING FALL IN TEMPERATURE DURING COOLING-DOWN (NO. 2 RETORT-HOUSE).

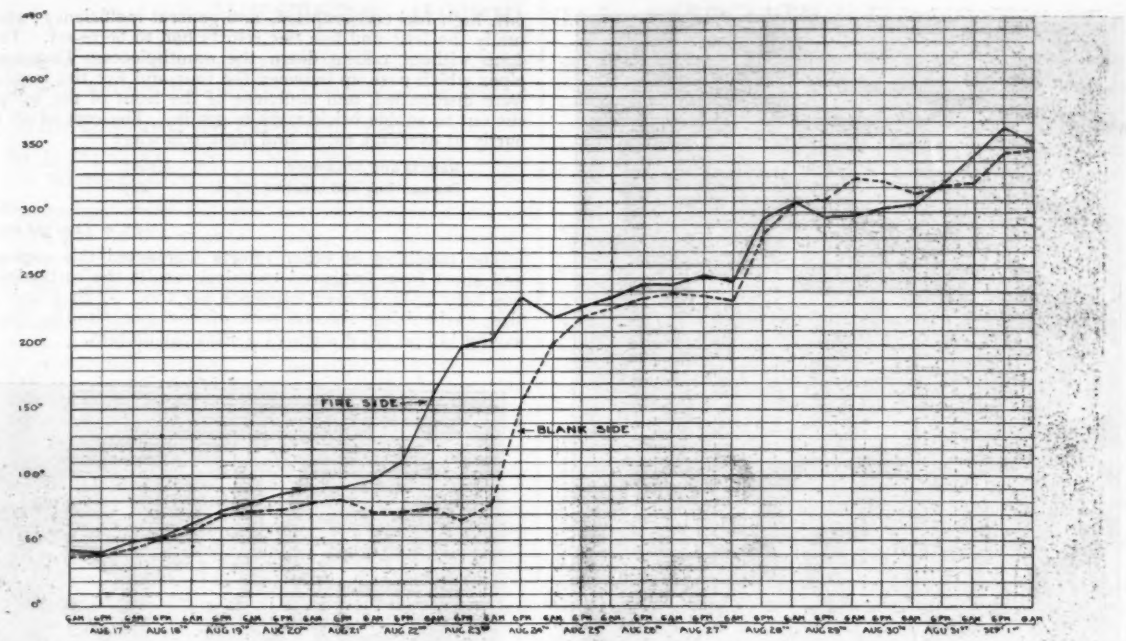


CHART J.—SHOWING RISE IN TEMPERATURE IN COMBUSTION CHAMBER DURING LIGHTING-UP PERIOD (NO. 6 RETORT-HOUSE).

facing the same combustion chamber and heated by the same producer gas under symmetrical conditions. Figs. 5 and 6 show the effect after 950 days' work. The siliceous retort surfaces of fig. 5 are obviously slagged and covered with tear drops of slagged material. In fig. 6 the silica material is unaffected.

In the early days of silica, when the material was burnt at too low temperatures, failure to make adequate provision for expansion invariably resulted in retorts being thrust upwards on the combustion chamber side. Subsequently the makers improved their products, and the allowance which was then unnecessary was partly responsible for collapse.

The greatest number of failures have been traced to the use of unsatisfactory jointing material, but another source of failure arises from the destructive action of coke ash in the joints which become open through movement in the setting. Analysis of iron-stained zones in the proximity of the failures leaves little doubt that even with cement above suspicion it is essential to make every effort to preclude the possibility of foreign matter entering the joints. To this end makers of refractories should use every endeavour to produce segments of low porosity combined with perfect shape and smooth even faces.

Though the 270 retorts reset this year had a life of only 1069 days, the coal carbonized per retort, 1662 tons, compares favourably with the clay retorts worked at lower temperatures. To carbonize 19 cwt. in 12 hours, combustion chamber temperatures were maintained at 1400° C. for long periods; consequently all material used in the setting was thoroughly tested.

The first indication of trouble was the opening of retort joints mostly on the combustion chamber side, showing in many cases the complete absence of jointing material; and observations made during demolition confirmed the chief cause of failure to be due to the instability of the jointing cement.

An interesting example of the "sagging" of retorts, due also to the failure of jointing cement, is No. 9 Retort House. The forty settings, arranged in two benches, were reset in 1924. The work of re-setting was carried out by two contractors, one for each bench; and the silica used was purchased

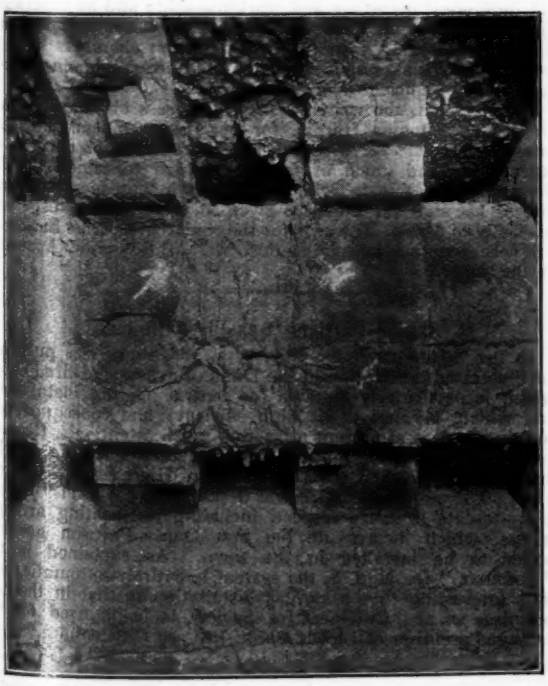


Fig. 2.—No. 8 Retort-House (No. 27 Set)—View of Four and Five High Right-Hand Retorts, taken from Centre of Set.

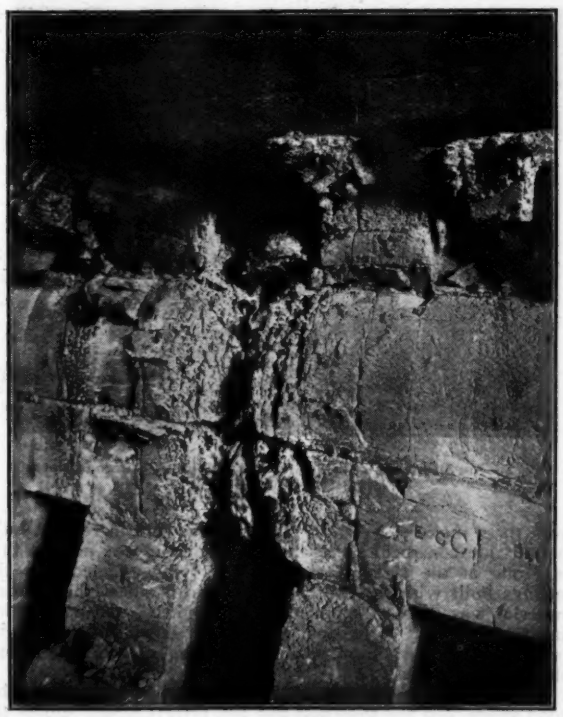


Fig. 3.—No. 8 Retort-House (No. 20 Set)—Close-up View, Section of 93 p.ct. Silica Segmental Retorts.

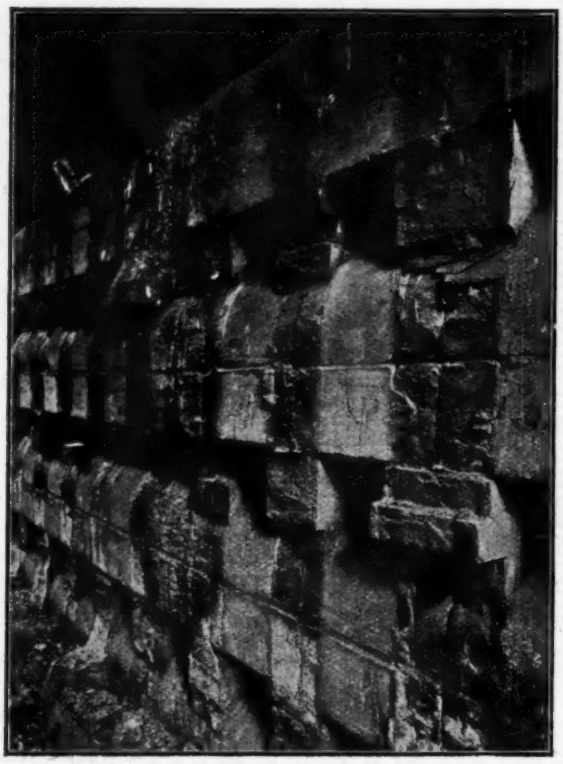


Fig. 4.—No. 8 Retort-House (No. 20 Set)—Close-up View, West Side showing Section of 93 p.ct. Silica Segmental Retorts.

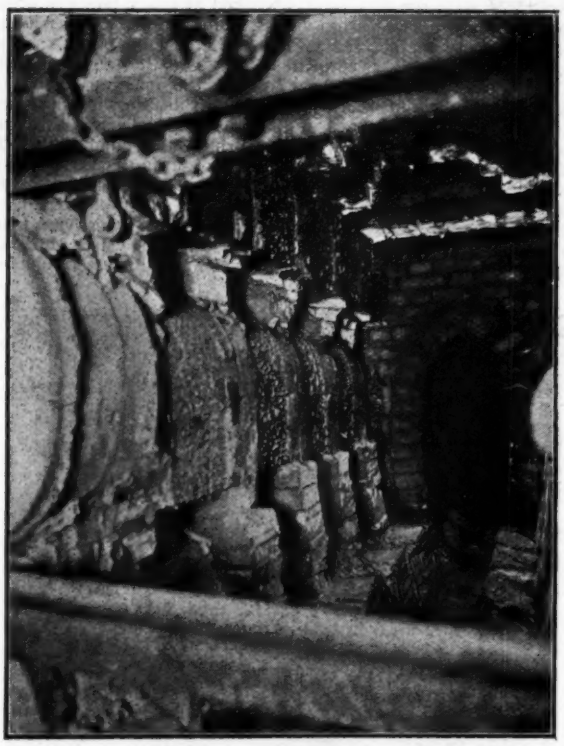


Fig. 5.—No. 3 Retort-House (No. 18 Set), Moulded Siliceous Retorts (Left-Hand West Side).

from three makers. Within three months certain retorts, built by separate contractors, began to sag, and it was noticed that only one of the three classes of silica was affected. In the settings built with the other two classes of silica, the jointing material was used as supplied by the makers, and no sagging has taken place. A setting was cooled down, and upon investigation it was found that the jointing material had completely disappeared.

The one, two, and three high retorts maintained reasonably good shape, but the four and five tier retorts which supply the producer fuel had sagged so badly that the machines could not push the charges. The effect of rather too intermittent producer feeding resulted in irregular temperatures, lower throughput, high fuel consumption, and general inefficiency; and eventually the four and five tier retorts had to be re-set. This was done without taking down the mouthpieces. Two ascension pipes which pass up between the four and five tier mouthpieces were dismantled, and sufficient of the front of the setting was cut out to enable bricklayers to get in. The cost of all labour, partly at overtime rates, and materials was:

Retorts and brickwork	£5659
Dismantling and erecting pipes .	247
	£5906 = £179 per setting

The condition of other retorts warranted this expenditure; and apart from improved technical results the carbonizing cost has been reduced over twopence per ton. With a unit of this size, carbonizing 200,000 tons of coal per annum, there is a saving in operating alone of £1600 per annum.

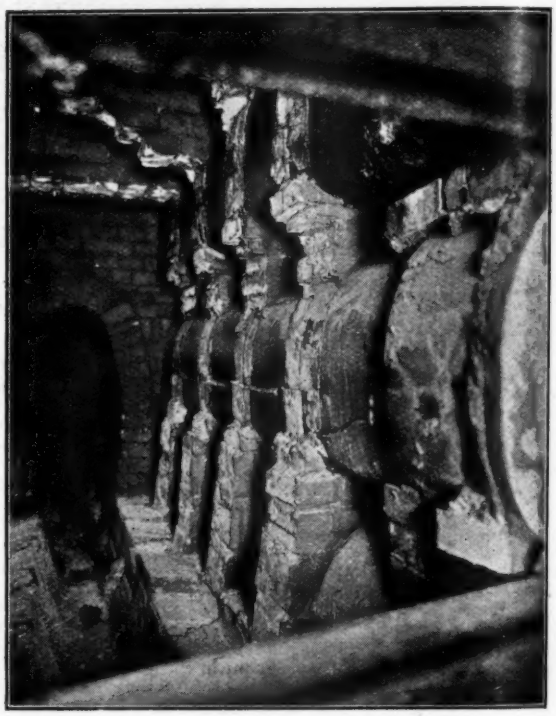


Fig. 6.—No. 3 Retort-House (No. 18 Set), 93 p.ct. Silica Retorts.

Failures in the past have originated solely from faulty design and indifferent materials and workmanship; and as experience has taught us what to avoid, the writer believes that for temperatures exceeding 1350° C. in combustion chambers silica is not only essential, but is an undoubted acquisition in the advancement of efficiency.

In conclusion, the writer wishes to express his thanks to his Chief, Mr. Thomas Hardie, for permission to compile these notes, and to Mr. W. B. Leech for advice in the preparation of experiments and much of the information contained therein. He would also like to acknowledge his indebtedness to members of his staff for the help given in carrying out tests, and especially to Mr. A. Edwards for the research work he has done.

(There remains for publication Mr. A. Edwards' Appendix to the paper.)

Danks-Pattison Gas-Fired Boilers.

In the "JOURNAL" for Nov. 9, p. 388, there was published an illustrated description of the Danks-Pattison gas-fired boiler, which is particularly suitable for central heating installations and which, because of its high efficiency and consequent low running cost, is at present attracting much attention. Recently new branch premises of the Gloucester Co-Operative and Industrial Society, Ltd., were opened in High Street, Cheltenham. This building, which was described in the local "Echo," is up-to-date in every respect, including the heating arrangements, which incorporate the first Danks-Pattison gas-fired boiler to be installed in the town. As explained in the "JOURNAL" for Nov. 9, the system is entirely automatic; and it is interesting that a similar installation to that in the new premises of the Co-Operative Society is being used for the enlarged premises of Lloyds Bank, Ltd., at Cheltenham.

Mr. EDWARD STOTT, of Guildford, who was a Director of the Chertsey Gas Company, left estate of the gross value of £4912, with net personalty £2597.

WESTERN JUNIOR GAS ASSOCIATION.

A Meeting of the Association was held at Weston-super-Mare on Nov. 5—Mr. ARTHUR MARSDEN, the President, in the chair.

THE CONTROL OF CALORIFIC VALUE.

By J. MALSBURY, B.Sc., Chief Chemist to the Weston-super-Mare Gaslight Company.

At Weston-super-Mare the gas manufactured consists of straight coal gas from horizontal retorts, with the admixture of 15 to 30 p.ct. of carburetted water gas; the two gases being mixed at the inlet of the holders. In the following notes I describe an attempt to control the calorific value of our coal gas by automatic means.

For the past two years we have had in use a "Sigma" recording calorimeter working on the coal-gas make. The instrument is accurate within 1 p.ct., and requires very little attention. About eleven months ago the possibilities of adapting a device (which the Sigma Instrument Company has used for another purpose) for the automatic control of the calorific value of the coal gas were seen; and in conjunction with Dr. J. G. Stewart (of the Sigma Company) the first controller of this type was devised, and put into action controlling the coal gas exhauster. To the best of my knowledge this was the first attempt ever made to control a gas exhauster by a calorimeter; and I believe that the instrument is still the only one of its type.

The device adapted to this purpose is a small attachment fitted to the top of the expansion tubes of the ordinary "Sigma" recorder, by means of which a small valve operates, varying the amount of gas passing through a small pipe. When the calorific value of the gas burning in the calorimeter is high, the valve is open; and as the calorific value falls, the valve gradually closes up. I shall refer to this again as the "leak valve device." Our coal gas exhausters at Weston-super-Mare are steam driven, and the control is carried out by varying the steam supply to the exhauster in the following relatively simple manner.

Gas is taken from the outlet of the exhauster, and passed through a small tar scrubber, an ammonia trap, and a small purifier, and thence through a governor. The gas stream is then split up into two parts—(*a*) one stream supplying the gas to the recorder through the usual "Sigma" governors *1* and *2*, and also two burners which are used to increase the flow of gas, and so help to cut out the time lag; (*b*) the second stream passing through a small governor *5* through the orifice *6* to the "leak valve device" *7* and the water control governor *8*.

As the amount of gas passing through the "leak-valve" *7* varies with the calorific value, it causes an inverse variation in the gas pressure exerted on the underside of the diaphragm in the water control governor *8*, which is nothing more than a gas governor adapted for operating a water valve.

The bottom portion of the water control governor is immersed in a water tank kept at constant level by feeding-in water through a ball valve. At the bottom of the governor is a small valve which is open when the gas pressure in the governor is high, and slowly closes as the pressure falls owing to the previously mentioned operation of the "leak valve device" on the calorimeter. Two inches above the water valve a small hole is pierced in the side of the governor to allow the passage of water from the tank. This water flows through the tube *10* to the water-loading tank, which is fixed to the top of the rod on the exhauster vacuum bell, replacing the customary weights. The tank is fitted with two overflows, both of which can be adjusted to give any maximum and minimum water load desired. The rate of flow from the low-level overflow is adjusted so that its rate is about 50 p.ct. of the stream of water fed into the tank from the control governor *8*.

It will be seen that the level in the loading tank will vary according to the amount of water being fed into it; and this varying load, *plus* the variations in vacuum in the exhauster governor bell, causes the latter to rise and fall, which movements are transmitted to the steam valve of the exhauster in the ordinary way. The point at which the water flow through the valve *9* is completely shut off can be regulated exactly by adjusting a small screw on the "leak valve device."

Let us now consider the cycle of operations with the instrument running. We will suppose that the water "on and off" point has been set at 480 B.Th.U., and that the instrument is recording a calorific value somewhat higher than this. Obviously no water is running into the loading tank, which has emptied itself as far as the bottom overflow pipe. The governor bell has found its level, and the engine is running fast, pulling the rich gas away from the retort house. The calorific value of the gas being made gradually falls until 480 B.Th.U. is reached. During this time the "leak-valve" has slowly closed, increasing the pressure in the governor *8*. When 480 is reached, this pressure is just enough to open the valve *9*, and water commences to flow into the loading tank. This water flow rapidly increases until at about 470 B.Th.U. it is full on. The water load tank begins to fill up, and the increasing load causes the exhauster governor bell to sink slowly, which motion is transmitted in the ordinary way to the exhauster steam valve, which is slowly shut off. When the water reaches the upper overflow, the tank is fully loaded, and the governor bell finds its own level (dependent on the two factors, vacuum and water load). This slowing-down of the engine checks the tendency of the calorific value to fall, and after a period which varies with the number of retort settings in operation, and other factors, the gas value commences to rise. As the calorific value approaches and passes the "water on and off point" (in this case 480 B.Th.U.) the reverse cycle of operations takes place. The engine speed is increased automatically, which checks the tendency of the calorific value to rise, and makes it fall again. So the operations proceed. As soon as rich gas is pulled over from the retort house, the exhauster is speeded-up to cope with it; while as soon as poor gas flows along, the engine automatically slows up until rich gas again appears. The instrument records the value of the gas passing the exhauster, and affords a visual check on the efficiency of the controller.

We have neither aimed at nor expected to obtain anything approaching a straight line as the recorded calorific value of our coal gas. What we sought for, and appear to have attained, is a reduction in the extreme variations usually experienced in the quality of gas from horizontal retorts with their "intermittent" charging, coupled with an even swing of the calorific value on either side of a desired and fixable standard, with the added provision that these variations should follow one another at fairly rapid intervals. We now have a fairly even variation in the recorded calorific value; and as the "peaks" follow each other at 30 to 35 minute intervals, we

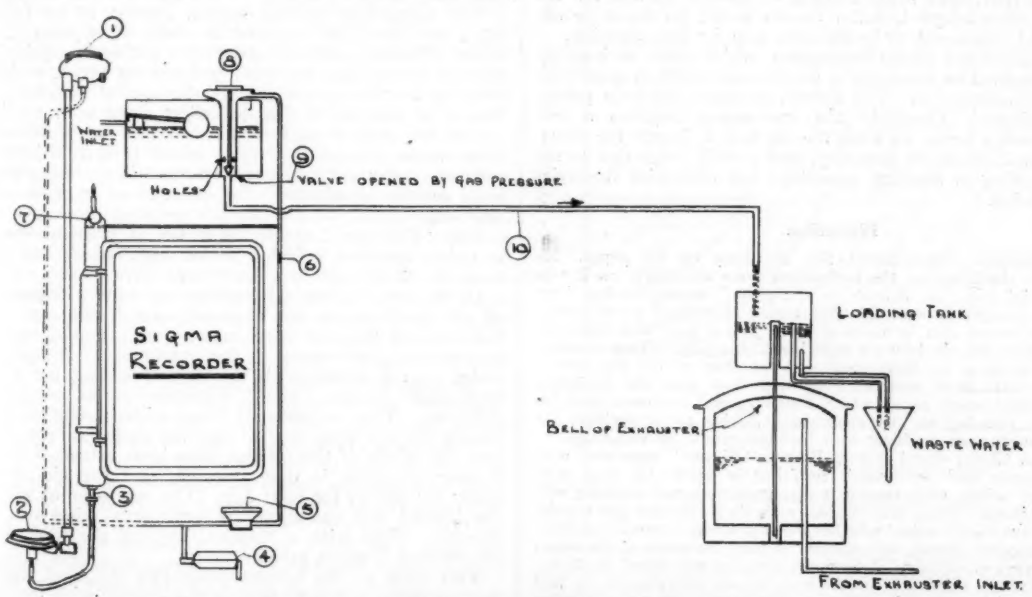
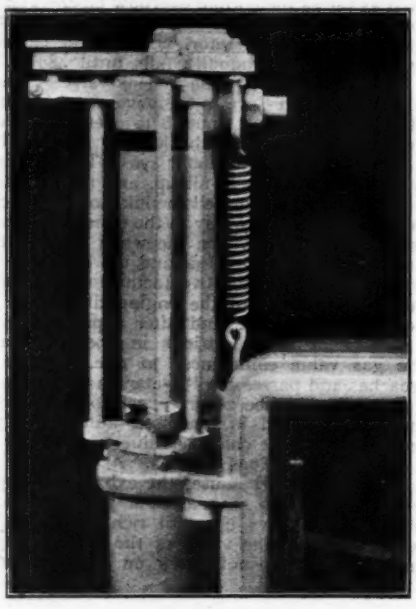


DIAGRAM OF "SIGMA" APPARATUS FOR AUTOMATIC CONTROL OF EXHAUSTER.

practically ensure that any holder into which the gas is being passed will receive an even mixture of gas, no matter how long it is being filled. Tailing-off of the calorific value in the period just before charging time is avoided, thus preventing one holder being filled with rich gas and another receiving gas of an inferior quality.

This instrument will automatically allow for many factors which may not be apparent on first thoughts. If a somewhat richer coal than usual is charged into the retorts, the instrument will ensure that the extra gas expected will be extracted without any adjustments. Likewise a drop in steam pressure will be compensated for by a partial failure of the vacuum under the governor bell, allowing the latter to rise, and restoring the original engine speed.

A difficulty we met with at first was friction in the various parts of the exhauster governor bell and the various rods, &c., which convey the impulse to the exhauster steam valve. We have taken certain steps to reduce this friction to a minimum, with a considerable increase in the working efficiency of the control, and a lessening in the length of the swing of the calorific value on either side of the required standard. Another difficulty encountered was the question of the best place from



The Leak Valve Device.

which to take the gas stream for the instrument. At first we took gas from the outlet of the station meter; but this was found to be unworkable, owing to the time elapsing between the gas passing the exhauster and reaching the meter. We then arranged to take the gas from the exhauster outlet, which we found satisfactory. If the instrument could be placed in the retort house, running on gas from the outlet of the retort house governor, and some method of distant control for the exhauster were adopted, better results would no doubt be obtained; and this seems to be the next step for investigation.

I have confidence in the instrument, which since its installation has enabled us to supply a much more uniform quality of gas to our consumers. The human element has been practically eliminated. Certainly the instrument requires a few minutes once a week, to wind the clock and change the chart, an occasional check for accuracy, and a daily inspection to see that everything is running smoothly; but otherwise it carries on unattended.

Discussion.

The PRESIDENT complimented Mr. Malsbury on his paper. He asked what checkings of the instrument were necessary, as it was an inferential one. At Bristol the "Sigma" apparatus had been used, and changes of external temperature influenced its accuracy. It was also found that an error of from 3 to 4 p.ct. was obtained, compared with Mr. Malsbury's experience of 1 p.ct. What time-lag was there between the instrument and the inlet of the exhauster? When the instrument was working with foul gas, the purifying apparatus used acted as an added time-lag, and increased load increased the time-lag on the apparatus. Advice as to purifiers for any such instrument working with foul gas would be welcomed.

Mr. HOLE (Bath) stated that at Bath a "Sigma" apparatus with direct indicator had been used, resulting in errors up to 5 p.ct. Trouble had arisen with regard to the governors not working efficiently; the burner being thus unable to obtain a constant gas supply.

Mr. J. KAYE (Bath) asked whether the instrument overcame fluctuations in the retort house, and whether it took the place of the retort house governor effectively. A 6-minute time-lag was found at Bath.

Mr. MALSBURY said that, in the case of six instruments he had used, four had been found correct to 1 p.ct.; the other two showed larger errors. If these instruments were checked once a fortnight, they maintained their efficiency. The old indicator type used a larger burner flame than the present one, and other small defects had been remedied. With regard to external temperature changes, the instrument had been found sensitive to draughts, which had been overcome by erecting a shield round the case. The purifying device consisted of a solution of dilute sulphuric acid used for removal of ammonia, and coke for extraction of tar. Two burners were arranged to pull gas quickly through the instrument; thus reducing time-lag to about two minutes. The instrument effectively overcame the retort house fluctuations.

A METHOD OF FEED-WATER TREATMENT.

By J. MALSBURY, B.Sc.

The process which I wish to describe has been in action at Weston-super-Mare for the past 4½ years, and is known as the "Filtrator" system. The basis of the system is to introduce either into the feed water or direct into the boiler a small stream of certain colloid substances. When evaporation of water takes place in the boiler, the dissolved mineral matter is left behind, and the concentration of the various salts increases rapidly until finally saturation is reached and minute particles of solid matter are formed in the water. With the "Filtrator" system, as soon as a small speck of solid matter is produced in the water, a thin film of colloidal material adheres to it; and though the small pieces of solid sink to the bottom of the boiler, the colloid film prevents the specks adhering together, so that, instead of scale being formed, the deposited matter is kept in the form of a soft mud which is easily blown out of the boiler by the periodical "blow-down." The interesting part of the process is the nature of the colloidal material utilized, its manner of preparation, and its method of introduction into the boiler water.

The source of the colloid is commercial uncrushed linseed. A glance at some analyses of typical specimens will give us the clue to the nature of the colloid.

	P.Ct.		P.Ct.
Oil	34½	..	37
Albumenoids	27	..	21
Digest. carbohyd.	22	..	24½
Woody fibre	9	..	10
Ash	7½	..	7½
	100		100

From the above analyses we see that there are two groups of compounds which can be extracted by infusion—(1) the albumenoids; (2) the digestible carbohydrates.

The linseed is placed inside a perforated container which is inserted inside the outer casing. Live steam is fed in at the top and finds its way through the linseed; the emulsions formed flowing out at the bottom of the apparatus through two small pipes. The woody fibre and the ash (or the mineral matter) present naturally are untouched, and the oil is not affected because the seeds require very heavy pressure to remove it. The albumenoids are turned into insoluble substance by boiling water; and as the steam temperature is some 120° Fahr. above the temperature of boiling water, they are thus rendered insoluble and retained inside the skin of the individual seeds. If crushed linseed were used, these substances would be removed and passed into the boiler, with possibly unpleasant complications. We now come to the digestible carbohydrates, which are removed in the form of colloids and consist of substances of the starch and gluten types, which are easily removed by the injected steam. The emulsion produced is fed, in our case, direct into the boiler itself through two small pipes, but may with equal advantage be fed into a water storage tank.

The advantages of the system appear to be fairly great. First we have the comparative costs of apparatus. With a water softening plant a considerable outlay is required to cover the cost of reaction, solution, and settling tanks, which usually take up valuable space and require special housing. In addition it is unusual to find softening plant with settling tanks which are large enough to perform their work efficiently. In some cases expensive filtering plant is installed in place of settling tanks; but whichever system of separating precipitated solid matter is adopted, the question of expense and space crops up.

The "Filtrator" apparatus in use at Weston-super-Mare is a 12-in. diameter cylinder 32 in. high which can be tucked away in small space in a convenient corner.

In the case of chemical treatment of water, frequent analyses of the crude water are required; and if for any reason the hardness of the untreated water varies much, continual adjustments are necessary in the amounts of softening material added to the water, with the risk of adding too much, with unpleasant results. The "Filtrator" does away with this difficulty. The container is filled with a definite amount of linseed (in our case 12 lbs.) and the steam supply adjusted so that the whole of the colloids have been extracted in 48 hours. A new container is then inserted, and the old one emptied ready for use on the next day. The operation of weighing out the linseed and changing the containers takes less than ten minutes, while with a chemical method the time occupied in the process is much greater.

Very close to the furnace tubes and the shell, contact with the hot metal seems to destroy the colloid, with the result that

scale is formed; but as this never exceeds $\frac{1}{16}$ in. in thickness (and is usually about half this figure) we can regard this as a protective coating. The scale so formed is usually soft, and may be brushed or scraped off easily. In fact, if the system is put into use on a boiler coated with scale, it will be found that the old scale is loosened and removed, its place being taken by the thin layer of soft scale already mentioned.

If lubricating or other oil is introduced by accident into a boiler, the colloid present will keep the oil in such a fine state of subdivision that the usual deposit, and consequent overheating, will be prevented.

I understand that tests have been carried out by the Filtrator Company in which untreated sea water was used in a boiler fitted with a filtrator for over 30 days, at the end of which the scale inside the boiler was less than $\frac{1}{16}$ in. thick. I think this is a good test when we remember that the hardness of normal sea water is about 800°.

Discussion.

The PRESIDENT stated that the linseed used with the "Filtrator" system cost about 1·9d. per 1000 gallons of water treated, which was rather high. The lime-soda softening process cost much less, though the initial cost of plant and upkeep were more. Whether the efficiency of the colloidal system was as high was debatable. With the linseed process, he asked whether during the "blow down" only the sludge near the "blow down" valve was removed. In the case of the lime-soda process, if it was properly controlled, a fine flowery deposit was left on the inside of the boiler, which was easily brushed off.

Mr. HOLE (Bath) asked if the water was supplied direct to the boiler or whether it was necessary to have a storage tank.

Mr. H. J. ALLEN (Weston) stated that the sludge formed a V channel to the "blow down" valve, but it was found that the sludge at the back of the boiler had a tendency after the "blow down" to work its way gradually to the front, and in turn was removed.

Mr. F. HAYNES (Bristol) asked at what time the boilers were "blown down," and to what amount.

Mr. MALSBURY replied that during the time they had worked the new system, satisfactory results had been obtained. No intermediate tank was used; the water being fed direct to the boiler. The "blow down" took place every morning and evening, when least inconvenient; and the amount was about two or three inches.

The PRESIDENT proposed a vote of thanks to Mr. Malsbury for his paper; and this was seconded by Mr. HOLE.

Mr. MALSBURY suitably replied.

STREET LIGHTING.

TWO PAPERS AT THE PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS.

One of the numerous conferences held in connection with the recent Public Works, Roads, and Transport Congress and Exhibition at the Royal Agricultural Hall was under the auspices of the Incorporated Municipal Electrical Association and the Institution of Gas Engineers. The chair at this sitting was occupied by Sir JOSEPH PETAVEL, K.B.E., D.Sc., F.R.S. (Director, National Physical Laboratory, Teddington); and two papers were submitted and discussed. The first was entitled "Street Lighting Regarded as an Illumination Problem," by Mr. J. W. T. WALSH, M.A., D.Sc. (Senior Assistant, Photometric Division, National Physical Laboratory); and the second was on "The Street Lighting of London," by Mr. W. J. JONES, M.Sc. (Engineer, Electric Lamp Manufacturers of Great Britain). Both papers were of considerable length; and it is impossible here to give more than the remarks with which the authors introduced them. Dr. Walsh's was awarded the second prize of a silver medal and £25 in an open competition arranged by the Congress Committee.

STREET LIGHTING REGARDED AS AN ILLUMINATION PROBLEM.

By J. W. T. WALSH, M.A., D.Sc.

In this paper an attempt is made to consider the various factors which affect the usefulness of any street lighting system—*i.e.*, the factors which affect the capability of the eye of a driver to discern objects on the roadway and irregularities in the road surface itself. The chief means by which an object is picked-up is the contrast between it and its background. This is the objective factor in the problem. The subjective factor is the condition of the eye which determines its power of perceiving any given contrast presented to it.

For the present purpose, it may be assumed that the sensitivity of the eye to contrast is determined by (*a*) the brightness of the field of view and (*b*) the degree of glare. It has been found that, to a first approximation, the effect of a bright source of light in the field of view is to lower the sensitivity of the eye by an amount which is proportional to the illumination which the glaring source produces at the eye, and inversely proportional to the square of the angle between the lines joining the observer's eye to the object and to the glaring source respectively (θ). The sensitivity (or more exactly, the insensitivity) of the eye may be conveniently measured by the percentage difference of brightness which it can just see. This percentage is called G in the paper; and fig. 1 shows how G varies with the value of E/θ^2 for different values of the field brightness.

It follows, then, that in order to obtain as small a value of G as possible—*i.e.*, a high sensitivity to contrast—the illumination should be high and the value of E/θ^2 low. At the same time, the contrasts between objects and the roadway should be as great as possible. In fact, the ratio of this contrast (expressed as a percentage) to the value of G is the factor of safety of the system.

It is pointed out in the paper that little can be done at present to increase the available contrasts. Our knowledge of the reflection characteristics of road surfaces is very scanty; and there is no doubt that the brightness of the ordinary dry road surface in a straight line ahead of the observer is very much more uniform than the illumination measured on a horizontal test plate at road level (see fig. 2). To strain after uniformity of illumination is therefore quite unnecessary. Moreover, a certain variation in the brightness of different parts of the road surface is desirable, in order that an object, whether it be light or dark in tone, shall present a strong contrast with some part or other of the roadway against which it is viewed. On the other hand, a patchy system of lighting is bad, both from the point of view of general appearance, and also because a patchy background is a difficult one on which to detect detail—a principle made use of in dazzle painting.

As regards the subjective side of the problem, it will be clear that the curves of fig. 1 will enable the value of G to be calculated for any actual or proposed street lighting installation for which data are available. The first step is to find the average

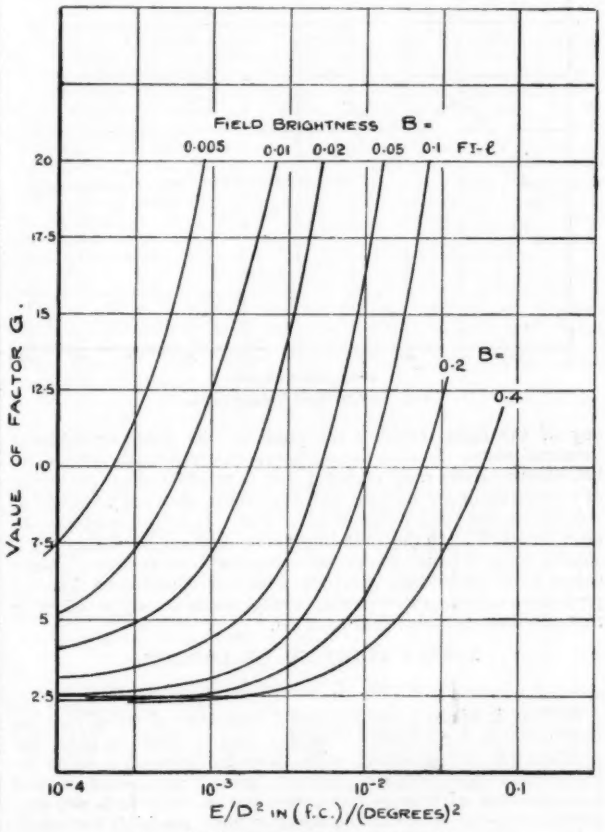


Fig. 1.—Relation between G and E_G/θ^2.

brightness of the roadway. This may be calculated from the polar-curve of light distribution of the fittings, their height and spacing, and a curve giving the reflection characteristics of the road surface. The average brightness found, G can be calculated

for any position of the observer's eye along the roadway, using once more the light distribution curve of the fittings to calculate E, the illumination each produces at the observer's eye, and then making use of the curves of fig. 1.

A specific example is fully worked out in the paper, and the resulting curve of G values along the road is shown in fig. 3. The maximum value of G is seen to be 4·5; whereas the value of G for a field of the same average brightness, but with complete absence of glare, is 2·5. This means that a contrast which

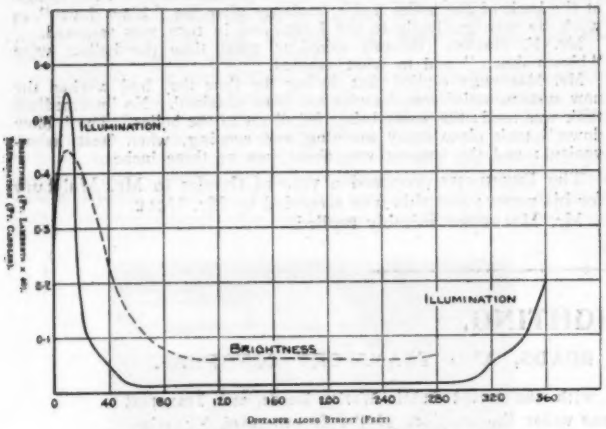


Fig. 2.—Reflection Characteristics of Road Surfaces.

would be just noticeable on the street if all glare were removed, would have to be almost doubled before it became noticeable under the actual lighting conditions assumed.

The paper concludes with a suggestion for the reduction of glare in the case of one of the simplest and most frequently encountered types of suburban lighting—*i.e.*, simple gas mantles or electric lamps mounted at a height of about 12 ft. and 200 to 300 ft. apart. It is suggested that such lamps should be provided with a simple type of semi-cylindrical shade carefully adjusted so that its lower edge just fails to obstruct

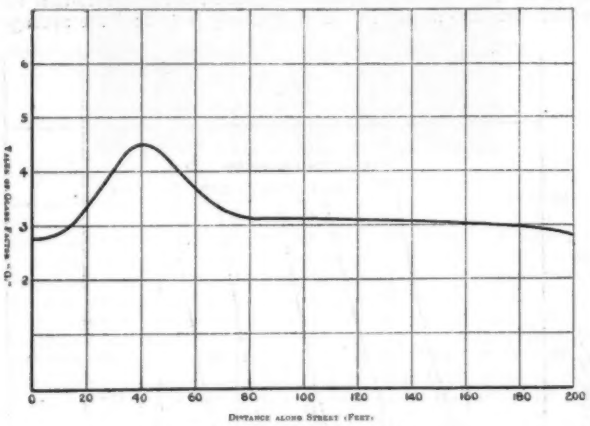


Fig. 3.—Curve of Values of G.

any of the light reaching the point of the roadway midway between posts. Such a shade would not materially affect the brightness of the road surface; but it would reduce the value of G, and so might be expected to increase the ease with which objects on the road could be discerned. It ought, perhaps, to be mentioned that the first impression created by fitting such shades would be that the illumination had been reduced. Only actual trials—preferably covering a sufficient period of time for prejudice to disappear—would really serve to show whether material improvement had resulted.

STREET LIGHTING OF LONDON.

By W. J. JONES, M.Sc.

In Part I. of the paper a general summary of street lighting requirements for London is made; and in order to place the problem in its perspective with other public works, some information is given regarding street lighting appropriations and a comparison of moneys spent on other works. It is not suggested that the other public services have too high an appropriation, but rather that that for street lighting is too small.

The general question of visibility during the day and at night is discussed; and it is pointed out that street lighting involves two considerations:

(*a*) That of distinguishing detail at close quarters.

(*b*) That of rendering a fairly large object visible at a distance.

The question of glare is discussed, and its resultant reduction in visibility; and it is shown that the speed of vision depends, other things being equal, on the general illumination provided. The greater the illumination, the greater the speed of vision. The visual effect of glare is not all that must be considered, since the question of comfort must also be given attention; and hence lamps of low intrinsic brilliancy should be used on short standards. This remark is equally applicable to gas and electric light sources.

Since the writing of the paper, the British Engineering Standards Association have issued an important specification on the subject of street lighting; but in order to make complete use of this specification, it is necessary to enter into the question of classification of streets. It is proposed in this paper that a Joint Committee be set-up immediately to consider this matter. In the paper there are some suggestions for street classification, together with some of the desiderata involved in lighting the thoroughfares mentioned. It is shown that in central areas abundant lighting must be provided, which will be necessarily much above any assessment on a minimum visibility at a distance basis. This is partly due to the fact that traffic is usually congested in these areas, and distant vision impossible. The importance of the surrounding buildings in visibility, by virtue of the contrast that they offer, is stressed, and it is proposed that in some instances it may be possible to instal screens which would assist in providing this contrast.

It is pointed out in Part II. of the paper that street lighting in London suffers greatly through lack of co-ordinated control; and it is shown that this lack of co-ordination results in patchy street lighting conditions and many anomalies. In some instances, gas lighting is available on the one side of the road, and electric lighting on the other side; arcs are installed on one side of the street, and gasfilled lamps on the other; 25-ft. columns are in one part of the street, and 11-ft. columns in another part of the same street; good lighting is available in one section of a thoroughfare, and desperately poor lighting in the succeeding portion. In general, the lighting of boundary roads suffers badly by this lack of co-ordination; and some boroughs can be definitely distinguished by the standard of the street lighting.

A LONDON PUBLIC LIGHTING DEPARTMENT.

It is suggested that the time is opportune for the formation of a London Public Lighting Department; and a proposal is made that an *ad hoc* body be constituted for this purpose. This must bring about a higher standard of illumination of our streets, which will reflect creditably upon those responsible, and be to the benefit of the public. It would directly effect the following:

1.—Make possible a uniform policy in the lighting of streets.
2.—Provide means for effecting investigations and improvements as a whole.
3.—Such a department could fully investigate the design of lighting fittings, test electric and gas lamps, and carry out regular inspection of street illumination.

PROPOSALS.

The following are the proposals contained in the paper:

1.—A central organization under the London County Council to have the over-sight of all street lighting problems in the Greater London area. This organization to be controlled by a Street Lighting Board representative of the existing lighting authorities.
2.—The organization to be constituted on somewhat similar lines to that already existing in Glasgow. The administration to be carried out by a senior officer with assistants who would be responsible for various areas or special aspects of public lighting. Each superintendent of lighting for a given area to be in charge of depôts and responsible for street lighting in his area, as regards both new work and maintenance. The senior officer to be responsible to the above-mentioned Committee for the efficient working of his department. Such a central organization would require a qualified staff of engineers and equipment for fully investigating the design of lighting fittings, testing electric lamps, mantles, &c.

It is fully realized that the constitution of a London Public Lighting Department would require much fuller consideration than outlined in the proposals above; but it appears to the author that the two main proposals are of fundamental importance, and it is hoped that they will afford an opportunity of giving this matter fuller discussion.

Discussion.

The CHAIRMAN remarked that in this country, and at this season of the year, a large portion of the active part of the business life of the people was carried through under conditions of public street lighting. They would all realize that the extraordinary traffic which was a feature of modern times made this question one of very great importance with regard to safety, and the speed at which it was possible to pass from one business centre to another. The efficient lighting of the streets was therefore not only a question of business, but also one of safety. It influenced the general amenities of a city.

There was no doubt that there was a strong psychological relationship between good lighting, good health, and a cheerful attitude.

Mr. W. J. LIBERTY (Association of Public Lighting Engineers) remarked that Mr. Jones had said in his paper that London as a whole, with regard to its street lighting, showed very little improvement since 1914. It was necessary to be very careful in making statements of this character, although the author had wisely qualified the assertion. During 1914, and a little while after, he (the speaker), in his official capacity, relighted the whole of the City of London; and even since that he had relighted it again, so far as gas was concerned, and had got 30 p.ct. better illumination.

MANY LIGHTING AUTHORITIES.

The author's suggestion for the establishment of a Department for the control of the lighting of London as a whole had his sympathy. There were a great many bodies in London who controlled the lighting. Including the Royal Borough of Kensington, there were no less than 28 borough councils, two cities (London and Westminster), the London County Council (who lighted the bridges, &c), the Office of Works, and the Bridge House Estates Committee. In fact, there were over thirty different bodies; and in walking about, it was quite possible to tell when one passed from the area of one authority into that of another. In connection with any Department set up there should be borne in mind the Association of Public Lighting Engineers and the Illuminating Engineering Society. For many years the Illuminating Engineering Society had been striving hard to bring the lighting of the streets of London up to a proper standard; while the Association of Public Lighting Engineers was now well established, and doing very useful work. The author gave a table showing the actual lighting rate levied; but he should have added another column giving the rateable value of the various areas, so that one might get an idea of the amount that was being spent. For instance, the net rateable value of the City of London was no less than £8,500,000; and a penny rate would bring in something like £34,000. Thus, while in the City of London the lighting rate was only 0·9d. in the pound, it was known to be the best-lighted city in the world.

The time had arrived when all the available knowledge on the subject should be pooled; and if it was impossible at once to adopt a standard specification for street lighting, some Committee should be formed. The Association of Public Lighting Engineers had called for such a Committee from among its own members; and this Committee would be in being in a month or two.

A COMPLEX MATTER.

Mr. T. E. RITCHIE (General Electric Company, Ltd.) declared that it was essential, if they were to have the improvements in street lighting which were so necessary and so long overdue, that the lighting of a road should be looked upon as being of equal importance to the making of the road. If the roads were efficiently lighted, much of the traffic could be suitably disposed of during the hours of darkness. Absolute uniformity was the very last thing that was desirable, rather than the very first. The question of street lighting was really an exceedingly complex and scientific matter; and it was high time that it should be understood that it was no use just putting up posts and fittings, and letting people come and look at them. There was a definite scientific basis underlying all good lighting; and this should be recognized, and put into practice. It was extraordinary to note how great a difficulty there was in getting people to recognize this fact. The Illuminating Engineering Society had been labouring for many years in the endeavour to educate, not only the public, but those who were more intimately connected with the roads; and, although one found encouraging features now and then, the progress in the mass had been very slow. He hoped the paper would do something to expedite it, by bringing home to people the real importance of the matter. As to Mr. Jones's paper, he did not think that anyone who had had anything to do with the lighting of any part of London could have failed to realize the pressing urgency of the formation of some such body as had been outlined. It was an absolute tragedy to those who were engaged upon these matters day by day to see what an entire lack of co-ordination there was.

FOR THE INSTITUTION OF GAS ENGINEERS.

Mr. JOHN TERRACE (Chief Engineer of the South Suburban Gas Company) said that, as representing the Institution of Gas Engineers, he was there to let the congress know that this Institution were very much interested in the question of street lighting, and were most desirous of doing what they could to help in the matter. It was a happy thought to arrange for two such papers to be presented to that meeting, because it afforded an opportunity of putting before those who were dealing day by day with the question of public lighting in their various districts information which had not hitherto been available. It seemed to him that perhaps the time at disposal would be best taken up by hearing the views of different surveyors on the suggestion that had been put forward by Mr. Jones. Surveyors, of course, had to take things as they were, and then try gradually to bring about improvements, without having to ask their committees to give them any more money to do it with. Mr. Liberty had touched upon an important point when he mentioned the rateable value of a district in connection with the outlay upon public lighting. In some of the cases that he (the speaker) had had before him lately, in which the question of the adoption of public lighting had been raised, the putting-up of half-a-dozen lamps or so had meant a halfpenny rate. This, of course, was altogether different from lighting the City of London. In the outer part of London there was the great difficulty that there were two or three different contractors supplying the public lighting. If the borough engineers could give to these contractors definite specifications of what was needed, and then consider the quotations submitted by the contractors on their merits, it would go a long way towards securing very much better public lighting than existed at present.

RIGHTS OF THE PEDESTRIAN.

Mr. LEON GASTER (Illuminating Engineering Society) remarked that what had been adequate in the way of lighting hitherto was no longer so. To-day there were absolutely new conditions, which had created fresh problems, the solution of which involved greater expenditure. They had to satisfy the public that this greater expenditure was well worth incurring. Whether by night or by day, the pedestrian still represented a large proportion of the public; and he had a right to be protected. The Minister of Transport should be induced to spend some money on experiments in street lighting. If they could get the Ministry of Transport to understand that the lighting of the roads was a part of their duty, they would have gone a long towards the solution of their difficulties in this matter.

PROBLEM OF GLARE.

Mr. HAYDN HARRISON said that street lighting had been tackled for a very long time by committees, and so on, and specifications had been drafted, but not used. The most recent specification it was their duty to try to induce everybody to use. No doubt there had in certain directions been a great deal of progress in the last fifteen years; but on the average he was rather inclined to support those who urged that there had been no improvement. He recalled a paper contributed to a similar congress in 1921 by the Distribution Department of the South Metropolitan Gas Company, who had to deal with a great amount of public lighting. Everybody who had seen the lighting carried out by that Company and by the Gas Light and Coke Company would agree that a big improvement had taken place even since 1921. In the paper to which he had referred, the subject of glare was dealt with in the following words:

> The matter, however, has become of such extreme importance within the last few years—principally owing to the use of unscreened gas-filled electric lamps—that it merits some little attention here. The cause of glare is almost always to be traced to the direct exposure of the eye to an unscreened light source whose light emission per unit area of surface is greater than a certain amount—that is to say, glare is attributable to too great an intrinsic brilliance of the luminous source. Exposure of the eye to such a source causes temporary contraction of the pupil, together with a temporary, or in some cases possibly a permanent, paralysis of the optic mechanism.

If they turned to Dr. Walsh's paper, they would find that a very great change had occurred in these views. This change had been largely brought about by the experiments of Bordoni and Holladay, whose results now appeared to have been accepted as a correct definition of glare. He, however, ventured to suggest that the matter was not quite settled, for the simple reason that in street lighting they were dealing with psychological effects, and had to take the verdict of the majority. There was still something to be said for diffusing globes, despite the figures obtained by the investigators he named. Dr. Walsh's suggestions with regard to the use of screens were logically sound, provided one aimed at the illumination of road surfaces only; but they were not practicable if one desired illumination above the road surface. They wanted to illuminate the face; and by doing this they illuminated the eye. It was the illumination of the eye that gave rise to glare. The problem was therefore a very difficult one.

SOURCE OF LIGHTING AFFECTS GLARE.

Mr. J. F. COLQUHOUN (Sheffield) said that, in the matter of glare, Dr. Walsh did not discriminate between the different sources of light. He himself found that the discomfort from an unscreened gas-filled electric lamp of any given candle power was altogether out of proportion to that caused by a similar candle power from a frosted electric lamp or from incandescent gas mantles. This would seem to suggest that the source of light had something to do with the matter. In public lighting questions, he had always found that cost came first. He knew that in Glasgow Mr. Langlands had successfully relieved congestion by lighting alternative routes. People were apt to contrast the lighting of streets with interior lighting; and as the standard of interior lighting was raised, so must be the standard of street lighting. The best method of comparison would be the cost per head of the population. This would give a fair basis, which the lighting rate certainly did not.

Mr. L. B. W. JOLLEY called attention to a new system of street lighting which was being considered in America, whereby the specular reflection from road surfaces was being utilized to obtain better street lighting. The difficulties arising from variation of the reflection factor were very hard to overcome.

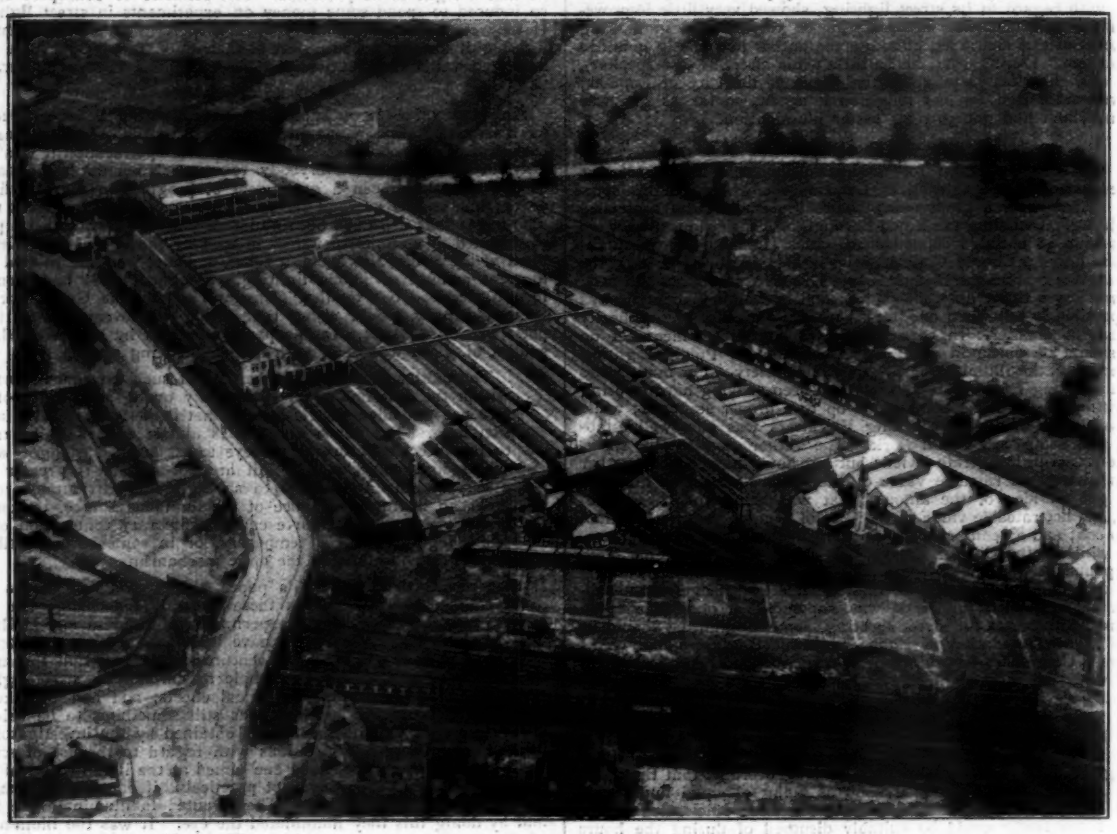
Mr. ALEX. C. CRAMB (President of the Association of Public Lighting Engineers) remarked that Mr. Jones suggested a body to control the public lighting of the whole of the London area. In the centre of London the illumination was quite satisfactory in the important areas. In some districts, however, the lighting remained bad; and therefore co-ordination was necessary. One reason why greater illumination was required was the enormous increase in the amount of fast traffic on the roads. What was wanted on the main roads was entirely even illumination throughout the whole length. He was not, however, quite sure whether Mr. Jones's suggestion was the best. Though the principle was right, he would suggest that an Advisory Committee who really understood street lighting problems to direct the different lighting authorities, and try to bring about uniformity, would probably bring better results.

IN GLASGOW.

Bailie J. MACDOUGALL (Sub-Convener of the Watching and Lighting Committee of the Glasgow Corporation) said that in the absence of Mr. S. B. Langlands, their Lighting Engineer, he would like to say what they were doing in Glasgow, and why they were doing it. During the past fifty years, a wonderful transformation had taken place, which showed that the lighting authorities had been awake, and that the public had not objected to pay for the better lighting of the streets. Last year the public illumination cost £50,000 additional in Glasgow, because of the general strike. The need for illumination was greater now than ever before; and Mr. Langlands had risen to the occasion. They had every confidence in him, and believed that, with what he was doing, and with his programme looking ten years ahead, Glasgow would not in illumination be behind any other city of Great Britain. The main thoroughfares were being illuminated by electricity; and the side streets were being provided with additional gas lighting.

THE PARKINSON STOVE COMPANY'S STECHFORD WORKS.

Visited by the Midland Juniors on Nov. 26.



AERIAL VIEW OF THE WORKS.

THE FOUNDRY.

A tour round the Parkinson Works at Stechford affords the visitor ample opportunity to see the many and varied activities which have placed this firm in the front rank of makers of gas cooking and heating appliances. The spacious shops are designed on hygienic and modern lines, are well equipped with up-to-date plant, and are capable of large-scale production and output.

The foundry is one of the largest in the Midlands; and all kinds of castings necessary for the production of cookers, gas fires, and other gas-heated appliances are turned out in large numbers. The method of conveying the molten metal from the cupolas to all parts of the foundry is by a modern overhead "safety-first" runway.

The enamelling department is a spacious, well-lighted, highly ventilated structure where all the processes of vitreous enamelling are carried out on cast iron, wrought iron, and copper under the most wholesome conditions. They embrace the very latest methods of liquid enamelling on cast iron.

In the polishing department castings undergo various processes, preparatory to receiving the well-known high-grade "art black," bronze, "armour bright," and "electro" finishes.

Accuracy in the highly technical operations of drilling and tapping is obtained by means of specially designed jigs which ensure exactness in the standardized interchangeable component parts which are a special feature of Parkinson manufactures.

A most ingenious type of gas-heated conveyor oven is seen in the blacking shop, where every cooker and all component parts, after having been blacked, are placed in at one end and taken out japanned at the other. This operation, which takes roughly 30 minutes to complete, guarantees that every cooker made is sent out stove-japan finished.

In the casting stores, awaiting assembly are large quantities of cast sections which, in the hands of skilled workmen, are quickly put together and passed forward to the testing department, where they undergo an exhaustive test.

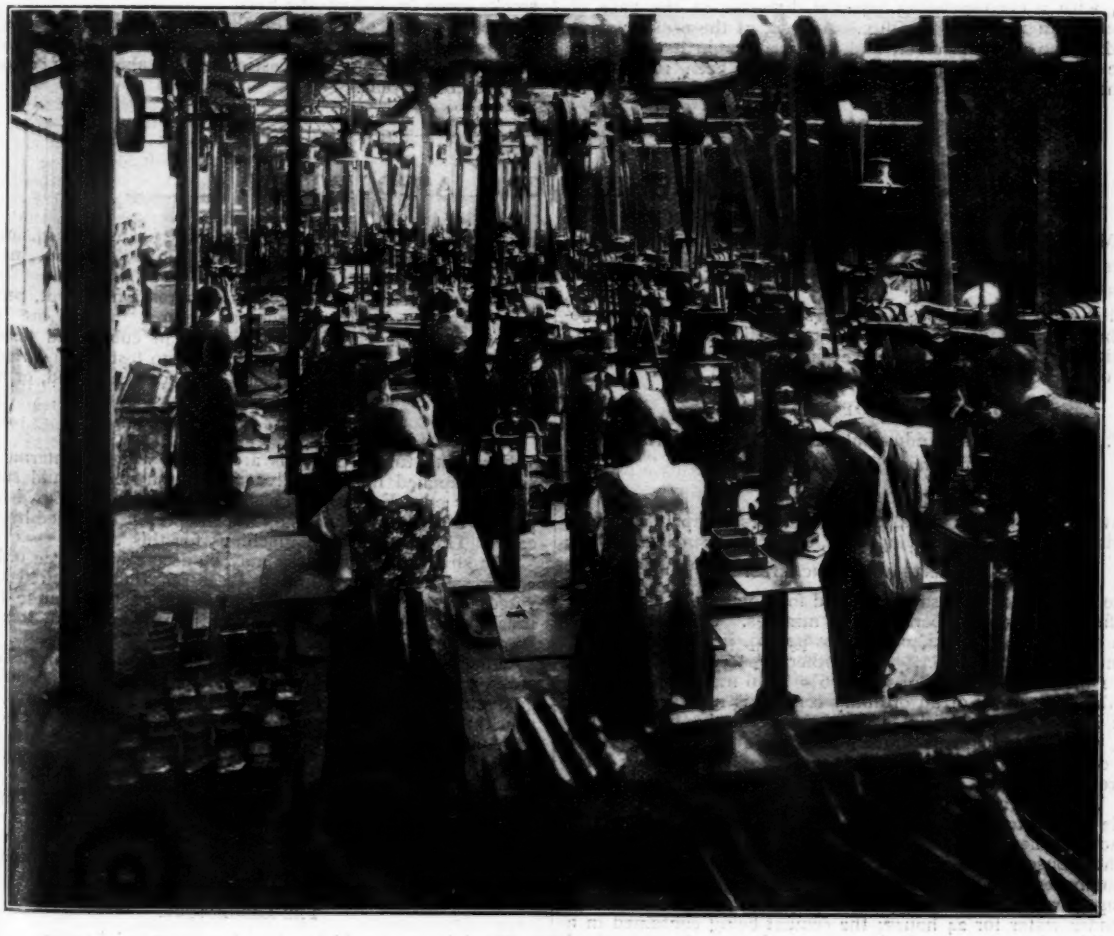
Most interesting and instructive is the pattern shop, where all kinds of patterns in wood, plaster, and lead, in various stages of construction, are on view, and where the master patterns of the "Standard" cooker for the National Gas Council were made, and patterns for the larger sizes are at present being made.

The great popularity of the gas-heated geyser is evident from the vast numbers in course of construction in the special department devoted to this product. Many well-known models are seen, including the celebrated "Teba," "Treasure," and "Jewel" types.

In the extensive warehouses, large stocks of gas cookers, gas fires, hotplates, and other gas-heated appliances await dispatch to all parts of the Empire. The loading deck is built to accommodate ten lorries at one time.

Raw material is received by means of the railway siding at the far end, while motor lorry transport deals with the delivery of a large proportion of the finished articles.

The research department and laboratory deserve special mention, for here much time and thought are devoted to exhaustive tests and trials to ensure the production of the perfect finished article. Exhaustive research work is constantly in progress, and one feels when passing through these various departments that there has been discovered in the exactitude of every detail employed the secret of the success of this most up-to-date manufacturing concern.



THE MACHINE SHOP.

A Vacuum Apparatus for Clearing Gas Pipes.

We have received from the patentees and makers, Alexander Sauer, of Duisburg, Germany, particulars of their "Hercules" apparatus for the clearing of gas pipes from dirt, rust, or other internal corrosion. It is in the form of a cylindrical tank, with hinged lid, and attached to it is a rubber gas bag. The latter is filled with gas which, when admitted to the tank, is exactly sufficient to form an explosive mixture of required composition. Means are provided for igniting this; and it burns with a slight noise. The lid of the apparatus is thus raised, but it is instantly closed again by the external air pressure; a vacuum being so formed. By means of rubber tubing, the apparatus is connected with the pipe to be cleared, and the fouling is drawn in by the vacuum, and caught in a dirt trap. Reduction pieces are provided so that gas pipes of various diameters can be treated. The apparatus can be easily carried by two men, or can be supplied mounted on a carriage. Excellent accounts of its working have been received from many satisfied users.

LECTURES TO SMOKE INSPECTORS.

The programme was reproduced on p. 273 of the "JOURNAL" for Oct. 26 of a series of lectures and demonstrations to assist candidates in the examination to qualify them for the post of smoke inspector. The lectures extend from Nov. 4 to Dec. 5; and brief abstracts of some of the earlier ones have already appeared—pp. 469, 522.

WORKING OF CHIMNEYS.

By S. PEXTON, Ph.D., B.Sc.

Draught is a static force which is consumed: (*a*) In discharging the products of combustion into the atmosphere. (*b*) In drawing the products of combustion through the chimney. (*c*) In transporting the products of combustion through the furnace against the resistance of the apparatus. (*d*) In drawing the air required for combustion through the fuel bed.

The first two items are small, and, as shown by calculation, are not likely to exceed 0·1 to 0·2 in. water gauge. Item (*c*) varies according to the design of the boiler or furnace; but in any one installation it varies approximately as the square of the rate of operation. With water-tube boilers, the resistance under high load may exceed 1 in. water gauge. Item (*d*) depends upon the condition of the fuel bed, and particularly upon the type of fuel—*e.g.*, under similar conditions anthracite slack requires three times as much draught for efficient combustion as does normal steam coal.

Draught of more than 3 in. water gauge may be required in boiler practice when working under maximum load. To produce this draught naturally would require chimneys 500 ft. high, with a corresponding internal diameter at the base of not less than 20 ft. for stability. A stack of these dimensions would be too costly to erect, and too irregular in its operation to be satisfactory. Similar problems have been responsible for the development of artificial draught. Draught supplied to the fuel bed by positive means eliminates difficulties resulting from the combustion of varying grades of fuel, and, further, it reduces the draught above the fuel bed and in the furnace, and thereby reduces air leakage into the products of combustion, and so increases the thermal efficiency of the installation. Induced draught produced by fans situated near the base of the chimney stack overcomes the increased resistance of the apparatus operating under high load, and obviates the use of very large chimneys.

In relation to smoke abatement, draught is important. Inadequacy of draught often causes "dead" coal to accumulate on the furnace grate, which results in smoky combustion. Excess draught results in thermal inefficiency of the furnace consequent upon the excessive in-leakage of air. Steam-raising plants operated at low rates emit smoke because the temperature of the fuel bed falls, and low-temperature distillation of the unconsumed coal results.

SMOKE.

By Dr. J. S. OWENS.

Dr. Owens is giving four lectures. The first of these dealt with the nature and causes of smoke. He pointed out that smoke was produced only after fresh coal had been added to a fire. Tar vapours were then distilled off, and gases which made the pleasant flames over coal fires, but were also the source of all the smoke. He said that smoke from domestic fires contained up to 30 or 40 p.ct. of tar; while that from industrial furnaces contained under 1 p.ct. This difference enabled one to get some idea of the source of smoke from the amount of tar contained. He said that in London about two-thirds of the smoke came from domestic fires.

The evil effect of smoke on the atmosphere, vegetables, and buildings was dealt with; and the economic loss in London alone due to smoke was estimated at about £9,000,000 or £10,000,000 a year.

MIDLAND JUNIOR GAS ASSOCIATION.

A Meeting of the Midland Junior Gas Association was held at the Council House, Birmingham, on Nov. 17—Mr. H. R. HEMS presiding.

A list was read of those members of the Association who had been successful in the 1927 Examinations under the Institution of Gas Engineers' Education Scheme; and the Chairman offered them his congratulations.

THE TESTING OF MATERIALS.

By F. L. ATKIN, of the Industrial Research Laboratories of the Birmingham Gas Department.

[EXTRACTED.]

Having described in detail tensile, hardness, impact, torsion, shearing, bending, and forcing tests, the author considers

CEMENTS AND CONCRETES.

The neat cement, he said, is tested for fineness by sieving on two fine meshes for a period of 15 minutes. One sieve has a mesh of 180 × 180 = 32,400 meshes per sq. in., and must not retain more than 14 p.ct. The other must not retain more than 1 p.ct. with a mesh of 76 × 76 = 5776 meshes per sq. in. The time of setting of an ordinary cement is measured in two parts known as the initial setting time and the final setting time, with an apparatus known as Vicat's needle. A pat of neat cement is made in a special mould, and a needle 1 mm. square, loaded by a set weight, is allowed to sink through the pat. The cement is considered to be initially set when the needle refuses to sink through to the bottom. The final setting is shown when a small sharp-edged cylinder, with the set weight, refuses to mark the surface. The soundness of cement is usually tested by the Le Chatelier method. This consists of boiling in water for six hours a small pat of cement which has set under water for 24 hours; the cement being contained in a split thin sheet brass cylinder; two pointers of a standard length being attached to the split ends. The distance apart before and after boiling is measured, and should not display a greater total expansion than 10 mm.

The tensile strength of the cement is tested by putting the mixed cement in a special mould which gives a cross-sectional area at the smallest part of exactly 1 sq. in. The cement is allowed to set for 24 hours, and is placed under water for seven or more days—usually seven—and then tested in a special machine with a fixed grip at the bottom, and having an automatic cut-off gear, the load being applied by lead shot, water, or similar means. The cement is also mixed with three times its own weight of sand, and is tested for tensile strength as above.

To pass the British Standard Specification, the neat cement must have a strength of not less than 450 lbs. per sq. in., and the cement and sand not less than 200 lbs. per sq. in. after ageing for seven days.

Concretes are always tested in compression, except, perhaps, concrete or reinforced concrete beams, which are tested as beams. The concrete is moulded in cubes and tested on spherical seatings. The object may be to test the concrete as a whole, or any of its constituents—*i.e.*, cement, sand, or aggregate. The concrete fracture is usually cone-shaped.

HYDRAULIC TESTS ON TUBES.

For small tubes, the ends are closed, and the internal pressure is applied hydraulically with a non-elastic fluid such as water or oil. For large tubes, the ends may be closed by the platens of a testing machine, and the pressure applied hydraulically. There are special machines for this test.

The strength of firebricks may be ascertained in an ordinary compression machine; and if the strength is required at elevated temperatures, a small furnace is installed close to the machine; the specimen being rapidly transferred from the furnace to the machine.

Other special tests which a physical laboratory must be prepared to undertake are efficiency determinations; indicating of gas, steam, and oil engines, compressors, and pumps, &c.; checking of screw threads for pipe fittings; testing of electrical instruments; tensile properties of belts, ropes, and couplings; determination of the coefficient of friction—for example, the effect of belt dressings on the coefficient of friction. Case-hardening compounds are tested for penetration and hardness giving properties. The effect of various heat-treatments on the physical properties of metals is another field in which a great deal of testing is carried out. Timber tests are important. Timbers are tested in tension and compression.

THE LABORATORY.

The laboratory which caters for commercial testing is somewhat different from the ordinary works laboratory. Its position should be in the centre of a manufacturing area. The services of the laboratory should be available at all reasonable hours, and it should be so staffed and equipped that tests may be performed quickly, in order that material in various stages of manufacture may not be held up. It must have a comprehensive set of measuring instruments, and also suitable certified standards or sub-standards of measurements. The temperature of the room should be kept reasonably constant. One laboratory in the Birmingham district has thermostatically controlled radiators for this purpose.

VOTE OF THANKS.

The CHAIRMAN, in moving a vote of thanks to the author,

observed that the latter had shown clearly the imperative need for tests, accurately made. Laboratories on the lines of the Birmingham Industrial Research Laboratory were necessary, so that they could be available to the gas industry. To industry in general the provision of such facilities was also most important, particularly in relation to tests on the heat-treatment of forgings, and hardness tests of dies.

The resolution was seconded by Mr. A. R. MYHILL (Central Laboratory, Birmingham), who pointed to the need for testing much of the material used on gas-works.

Mr. W. MACNAUGHTON (Wolverhampton) congratulated the author upon his paper.

The reply of Mr. ATKIN terminated the meeting.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Test for Naphthalene in Coal Gas.

SIR,—While reading the Presidential Address of Mr. C. H. Chester to the Yorkshire Juniors, I noticed his description of what he termed a new test for naphthalene in coal gas.

Might I point out that as long ago as the year 1909 I described this method somewhat in detail. Having devised it, and used it for quite a long time previous to that date, I thought the information would be of general service, and therefore published it. If Mr. Chester, or anyone else, has found it useful, I am glad; but my object in writing you is to correct the idea that it is new.

J. HEWETT.

39, *St. Asaph Road,*
Brockley, S.E. 4.

Welding Repairs to Gasholders.

SIR,—Representing the firm who carried out the repairs to the Folkestone gasholder, I am naturally interested in your editorial remarks regarding gasholder accidents, and also in the remarks made by those participating in the discussion on Mr. Hodgson's paper on gasholders.

The Pittsburg explosion and consequent damage are appalling, and if the report is correct that repairs were being executed in the interior of a gasholder by means of the oxy-acetylene flame, the action was foolish in the extreme.

I agree with you there should be no secrecy regarding these mishaps, such as the case at Manchester, and should be glad to know definitely, in the interests of the welding trade, whether or not welding was in progress in the vicinity of the gasholders at the time of the explosion.

Regarding the so-called accident at Folkestone, welding repairs by the electric arc process were in progress in covering a vertical seam adjoining the butt strap. The method proposed was to execute the repairs from the crown plate downwards, in order to keep the damaged part immersed in the water seal as much as possible; but as the coal strike was on at the time, it was necessary to inflate the holder as much as possible, owing to the bad gas quality of the coal carbonized. Consequently my men, being impatient waiting for the holder to be lowered, continued with the repair in an upward direction, resulting in a leakage becoming ignited out of reach. It was only possible to extinguish the flame by exhausting the holder on town supply and to other holders; thereby lowering the damaged portion into the water seal, when the flame automatically expired.

There was no accident and no extended damage to the holder other than a small loss of gas; and the writer was a spectator of the incident, with the Manager and officials of the works. The Press, of course, at that time being rather short of "stunts," took full advantage of the affair.

The repairs to the seam referred to were completed after the above incident, and further repairs have been done by ourselves to the same holder again in September-October this year, and also to holders at Norwich and on the Sandringham Estate.

In the hands of welding firms with a thorough knowledge of gas containers, welding repairs by the electric arc process are perfectly safe and permanent; and I should welcome an opportunity of demonstrating this, by means of a lantern lecture, to gas engineers, in view of the intense interest displayed by them at the present time.

ARCHIE E. PLUMSTEAD.

120, *King Street,*
Norwich, Nov. 26, 1927.

Nuneaton Gas and a Two-Part Tariff.

SIR,—I have read with interest Mr. Helps' suggestion of a two-part tariff, referred to in your issue of Nov. 16, p. 476.

I have always felt that Mr. Helps appreciated the fact that we are selling something else besides gas—viz., service—but up till now I have had the impression that he objected to the gas supplier being called upon to give this service. However, it is now clear that he considers there is something in the idea of the two-part tariff; and I presume he is aware that the National Gas Council and other bodies have had this matter under serious consideration for the past year or so.

The point which emerges from Mr. Helps' letter, however, is that in making a comparison in the past between what gas is sold for and what gas ought to be sold for, he has not taken fully into account the economic effect of the services rendered. It now appears clear that, whenever he has preached the gospel that gas ought to be sold for 4d. per therm, he means the gas only, and not the attention and service hitherto inseparable from the sale of the commodity under the flat-rate tariff.

It is interesting to examine Mr. Helps' figures in the light of what other companies can do. He states that if all his consumers would pay him 1s. per week, he could sell the gas at 4d. per therm. For the Nuneaton consumers, 1s. per week represents about 10·6d. per therm. In other words, the two-part tariff, expressed as a flat rate, amounts to 14·6d. per therm. Further, Mr. Helps states that 1s. per week covers the incidental expenses, and includes the profit on capital. We must, therefore, presume that the 4d. per therm covers approximately the cost into gasholder.

I have extracted the following from "Field's Analysis" for 1925, purposely avoiding 1926 on account of the coal strike. The following gives the cost into the gasholder of the three principal London Companies, and comprises: Net coal costs, purification, manufacturing salaries and wages, and repair and maintenance of works:

Gas Light and Coke . . .	4·621d.
South Metropolitan	4·400d.
Commercial	4·446d.

These figures seem to show that, in spite of Mr. Helps' continual insistence that London gas is too high in price, it does not compare unfavourably with Nuneaton, particularly in view of the fact that the 1927-28 figures will be lower than the above.

I feel that, in writing this letter, Mr. Helps has made a distinct advance in his appreciation of the effect of the two-part tariff; and as long as he realizes that the service, capital, and incidental charges increase the price of Nuneaton gas from 4d. to 14·6d. per therm, he will realize that there is something to be said for other companies who sell gas at round about 9d. and 10d. per therm, and give at least equal facilities and as good service as Nuneaton. In the figures above mentioned, although the cost into gasholder works out at 4¾d. per therm, the Companies in question sold gas at 8d. to 9·4d. per therm throughout the year.

ENGINEER.

Nov. 28, 1927.

Explosions.

SIR,—I was pleased to read your editorial remarks on gasholder explosions, advocating making public the real causes of such occurrences.

I see in the current issue of the "GAS JOURNAL" an account of an explosion in a 24-in. gas main. It is not stated whether the explosion took place at a depression in the main, but it is possible, if the main has many ups and downs, or even one dip, that some air, instead of being pushed forward by the gas through such a large main (with a very small escape for it at the far end, and which exit is probably situated at the top of the main), may have been left behind in the pipe in the hollows; gas passing, as it were, over the top of it.

I recollect that when acetylene gas was first introduced to the notice of gas engineers (at the Royal Society of Arts), by Prof. Lewes, with the proposal to employ it for enriching coal gas, I suggested to a friend that, acetylene gas being much heavier than coal gas, the gases would "layer out;" the heavier gas tending to lie dormant in the bottom of the mains. Prof. Lewes observed me, and exclaimed: "What's that, Mr. ——; no libel I hope?" My friend then put the question to him, and he admitted that it was the only doubt about the practicability of its adoption for the purpose. Apparently my surmise was correct, for acetylene has not been adopted for enriching coal gas, because it was found that the gases "layered out"—*i.e.*, the heavy acetylene gas remained in the bottom of the pipe while the lighter gas floated over the top of it.

May it not be, therefore, that, in filling with gas mains which are already charged with air, there is the danger (unless proper precautions are taken) of layering taking place?

I would suggest that the air should be expelled from the underside of gas mains, instead of the top, and that in a long main there should be several exits for the air situated at the bottom of the said main, which exits can be plugged one by one as it is found that the air has been ejected; the last hole in the main being, of course, the last one to be plugged. If a vent pipe must be brought upwards, it should be taken off the bottom and kept as low as possible.

Of course, the most remarkable fact about the explosion reported in the "JOURNAL" is that there was apparently no light to ignite the explosive mixture; and therefore your informant's idea that some chemical change took place capable of causing the explosion would appear to be the only solution. But if this be so, what protection is there against explosions taking place in gasholders or anywhere else, if modern gas is liable to such antics even when no light is about?

CIVIL ENGINEER.

Nov. 26, 1927.

P.S.—I note that in Mr. Hole's "Distribution of Gas," under "Blowing Air Out of Mains" (p. 181), the author advises the opposite course to that I mention above—viz., taking a blow-off pipe to a height of 20 ft. above the main. Possibly this is to avoid any contact with a light at a lower level. But every precaution must, of course, be taken to avoid this. The main point is to displace all the air in the pipe.

When blowing air out of the crown of a gasholder, the blow-off pipe is always taken down to within a few inches of the water level of the tank, otherwise, as the gas rises to the top of the crown, much air would remain stagnant in the lower part.

REGISTER OF PATENTS.

Floor-Plate Fittings for Gas-Fires.—No. 278,510.

BROMLEY, H. H., of Farringdon Road, E.C. 1, and SHEPPARD, M., of Alexandra Park, N. 22 (legal representative of H. L. Sheppard, late of Farringdon Road, E.C. 1).

No. 23,314; Sept. 21, 1926.

According to this invention, the floor-plate and the lower end of the bend of the fitting are provided with co-operating parts which are, when the bend has been adjusted, pressed into contact with one another by a coupling nut which bears against a shoulder on the bend and engages with screw-threads on the exterior of the hub of the floor-plate. This hub has an inner coned seating, while the bend of the fitting is formed with a corresponding cone and with a shoulder. The bend of the fitting is provided at its outer end with a back nut for a gas cock, to enable the latter to be fixed in a gas-tight manner in any position on the outer end of the bend.

Flue Nozzles for Gas Cookers.—No. 278,630.

OAKLEY, P., RICHARDSON, W. H., and STOVES, LTD., all of Rainhill.

No. 14,674; June 1, 1927.

This invention consists, in its simplest form, in providing a nozzle with a through horizontal passage at right angles to the back plate —attached to, or formed integral with, the back plate of the oven —with an opening or slot at its lower side and with a reduced portion constituting a shoulder for the reception of a flue pipe when such is required. In another form is provided an adjustable elbow or **T**-piece with an air passage leading to its interior; such elbow or **T**-piece being coupled to the usual outlet flue pipe and arranged in such a way that the elbow or **T**-piece can be adjusted to any suitable angle so as to enable the flue pipe to be led out of the room to atmosphere at any position required.

Hopper Discharge Doors.—No. 278,539.

GAS LIGHT AND COKE COMPANY, of Horseferry Road, S.W. 1, and LEECH, W. J. B., and BIRKS, F. M., both of Beckton.

No. 28,202; Nov. 9, 1926.

This invention relates to hoppers, &c., of the kind provided with a chute the outlet from which is controlled by a quadrant gate. The object is to provide apparatus of improved and simplified construction which will be easy to operate, and will require the minimum of attention; and it is claimed that the subject of the invention is specially suitable for dealing with ungraded material.

We reproduce a sectional side elevation illustrating a hopper in accordance with the invention. In this, *a* is the hopper and *b* its rockable sector gate, of which there may be one or more. The angle of repose of the material, indicated at about 38° in the drawing by the dotted line L, is determined by a rearwardly directed plate e^3. The hopper *a* is so constructed that the gate *b* will be relieved from supporting the full weight of the superimposed material, thereby enabling the gate *b* to be more easily and economically operated. Each gate of the hopper is constructed in the form of a quadrant or sector comprising two vertical side members connected along a part of their curved edges by a closing plate b^2 and by a hollow depending portion b^3 forming an annulus or secondary chute.

The gate co-operates with a chute *e* arranged at the lower portion of the hopper. The annulus b^3 in conjunction with the plate e^3 determines or delimits the area which is covered by the material being discharged into the truck; and the lip b^5 not only assists in the formation of the angle of repose of the material in the chute *e* in conjunction with the plate e^3, but also prevents the material escaping endwise out of the annulus b^3.

The chute *e* is formed of two vertical side plates e^1, which are connected by two forwardly inclined transverse plates e^2, e^3. Of these, e^2 extends from near the top of the chute to the bottom thereof; the other plate e^3 is directed rearwardly of the chute and inclined to the sector-like side plates e^1 so as to limit or decrease the outlet from the chute. The plates e^2 and e^3 thus converge downwardly. The chute *e* is unsymmetrical; but tends to direct the material forwardly in such a manner that the main transverse plate e^2 takes the bulk of the weight of the coal, and in such manner that the small transverse plate e^3 controls the formation of the angle of repose L.

To relieve the gate *b* of undue weight, and thereby facilitate easy operation, the chute *e* is of sufficient length to ensure that the bottom lip b^4 of the main transverse gate-plate b^2 extends a distance —for example *x*—forwardly and beyond the opening in the hopper, so that the direct load of the superimposed material is taken by the chute *e*, leaving only that portion comprised within the angle of repose of the material to be overcome or cut through in operating the gate *b*.

The gate *b* is swung about a horizontal axis *f*; and when the definite sealing of the gate is required, the gate is moved by means of a lever *g* or other operating device, and the closing portion b^3 is brought into place (as indicated in dotted lines).

The construction lends itself particularly for operation in series.

Purifiers.—No. 279,184.

CHRISP, G., of Port Talbot.

No. 18,782; July 28, 1926.

According to this invention, coal gas purifying apparatus comprises three series of horizontal tubes equipped with means to propel a finely divided solid along them and continually turn it over and expose it to coal gas passing in counter-current.

Finely divided oxide, mixed with sawdust or other moisture absorbent, is passed counter-current to the impure air in a tube or tubes, portions of which may be counterheated by a hot-water or steam jacket. The impure oxide is then elevated to a second series of tubes, in which it is passed against a counter-current of air. Cooling water may be used here to control the temperature and prevent damage. The revivified oxide of iron is then passed through a third series of tubes where it meets the gas leaving the first tubes and gives it a final purification.

Elevators or the like are arranged so that the oxide may be given one or more passes through each apparatus; or portions of its bulk may be so repassed. The air or oxygen for revivification may be passed through the regenerating tubes by means of natural draught or an injector or other suitable means.

In the treatment of coal gas to remove sulphuretted hydrogen, it is extremely necessary to keep the iron oxide in a finely divided condition. The worm of the paddles in the tubes keeps the oxide broken up; but it may be desirable to put an additional scrubber for the gas before the apparatus to remove moisture, tar fog, &c.

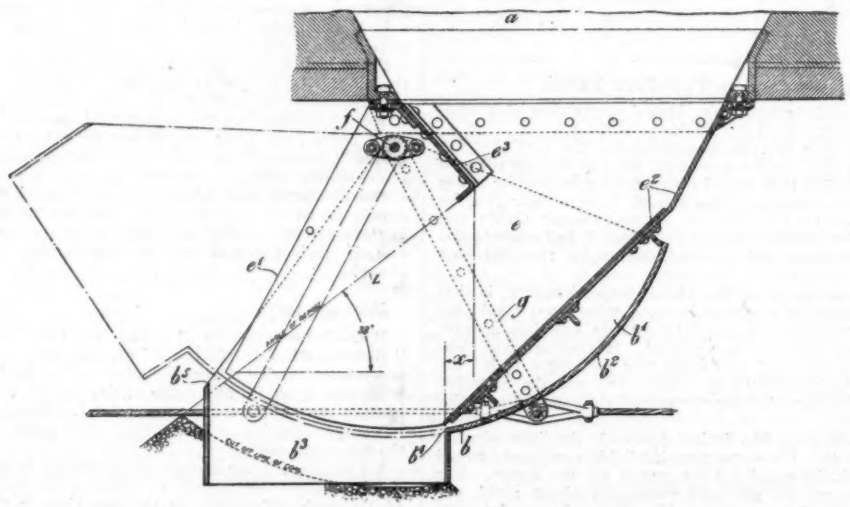
Refractory Bodies.—No. 279,201.

SOUTH METROPOLITAN GAS COMPANY, of Old Kent Road, S.E. 15, and LAMPREY, R. H. B., of Blackheath Hill, S.E.

No. 20,670; Aug. 21, 1926.

Refractory bodies, such as carbonizing retorts, are apt to be eroded at those places which are exposed to the highest temperature; and the patentees seek by this invention to minimize this destructive effect by applying to the surfaces which are liable to attack a coating of a highly aluminous material such as a mixture of plastic clay and calcined alumina. The mixture may be applied in the form of a paste or plastic mass or of thin tiles of suitable shape. A preliminary painting of the surface with a more fusible material, such as a mixture of refractory plastic clay with silicate of soda, is desirable in order to ensure adhesion of the protective coating.

The proportion of plastic clay to alumina should be such as will



HOPPER DISCHARGE DOOR—LEECH AND BIRKS.

give the highest alumina content compatible with the formation of a dense mass without undue shrinkage. As grog to reduce shrinkage, some of the mixture previously calcined may be used. A suitable mixture (in parts by weight) is: Plastic refractory clay, 60; calcined alumina, 20; and grog, 20.

Calorimeters.—No. 279,253.

SIMMANCE, J. F., of Westminster Palace Gardens, S.W. 1.

No. 27,580; Nov. 3, 1926.

This invention relates to the well-known gas calorimeters which comprise a recording thermometer adapted to register a rise of temperature in a liquid due to the heat of combustion of the gas the calorific value of which is to be measured. The object is to provide an improved construction of apparatus of this character.

Hitherto, the calorimeter proper has comprised a cylindrical vessel enclosing at its lower end the gas burner, the upper portion of the vessel being provided with a container to which water is continuously supplied from a chamber at a definite rate which is automatically maintained constant. One element of a differential recording thermometer is arranged in the container above referred to, and the other element in the cold water chamber, so that the thermometer records the difference between the temperatures of the water in the container and the chamber, respectively.

According to the principal feature of the present invention the apparatus is so arranged that while the container heated by the gas burner, and the cold water chamber, are secured to, and form part of, the calorimeter vessel, the corresponding elements of the differential thermometer which are immersed in the water contained in the chamber and in the container, together with the recording mechanism, are mounted upon a support arranged above and preferably forming a cover for the calorimeter vessel in such a manner as to be capable of removal for adjustment or repair without the necessity for disturbing or interfering with any other part of the apparatus.

According to a further feature of the invention, improved arrangements are provided for ensuring a constant supply of water to the cold water chamber above referred to; these arrangements comprising essentially a filter or strainer and a weir overflow, together with a controlling orifice through which the water is delivered to the cold water chamber. It will be understood that the filter serves to free the water from all solid particles, and that the rate of flow of water to the chamber is regulated by the combined action of the weir overflow and controlling orifice.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Nov. 16.]

Nos. 29,676—30,457.

BOWATER, N. J.—"Intermittent carbonizing plants." No. 29,825.

BRITISH ARCA REGULATORS, LTD.—"Automatically controlling temperature of steam." No. 29,827.

CHAMBER OVENS, LTD.—See Bowater, N. J. No. 29,825.

CHEMICAL ENGINEERING & WILTON'S PATENT FURNACE CO., LTD.—"Apparatus for treating gases with liquids." No. 29,926.

HARDY, H.—"Gas cooking stoves." No. 30,147.

HELMER, C.—"Gas heating apparatus." No. 29,849.

KEMP, J.—See Helmer, C. No. 29,849.

LANDER, C. H.—"Low-temperature carbonization of bituminous coals." No. 30,365.

LANDER, C. H.—"Vertical retorts." No. 30,366.

LINDSAY, T.—See British Arca Regulators, Ltd. No. 29,827.

LYMN, A. H.—See Bowater, N. J. No. 29,825.

MOORE, H. S.—"Apparatus for manufacture of combustible gas or gases." No. 30,104.

MOORE,—W. S.—See Moore, H. S. No. 30,104.

RAMSAY, D. M.—"Distillation of carbonaceous material." No. 30,275.

REGENERATIVE COAL GASIFICATION SYSTEM.—"Apparatus for enriching gas." No. 30,353.

SHAW, J. F.—See Lander, C. H. No. 30,365.

SHAW, J. F.—See Lander, C. H. No. 30,366.

SMITH, A.—See Hardy, H. No. 30,147.

SMITH, W. MEISCHFE.—"Apparatus for extracting tar from gases." No. 30,324.

TRAVERS, M. W.—See Regenerative Coal Gasification System. No. 30,353.

WALKER, J.—See Helmer, C. No. 29,849.

WILTON, N.—See Chemical Engineering & Wilton's Patent Furnace Co., Ltd. No. 29,926.

WILTON, T. O.—See Chemical Engineering & Wilton's Patent Furnace Co., Ltd. No. 29,926.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Kilmarnock Gas and Water Order Confirmation Bill: Royal Assented Nov. 23.

Beverley, Peterborough, and Calverley and Horsforth District Gas Orders: Referred to the Special Orders Committee.

Manchester Gas Order: Agreed to.

HOUSE OF COMMONS.

Progress of Bills.

Beverley and Neyland Gas Orders: Copies presented.

Manchester Gas Order: Approved.

Low-Temperature Carbonization.

On Nov. 22 Mr. WHEATLEY asked the President of the Board of Education if he was aware that the Department of Scientific and Industrial Research had handed over the results of certain investigations at the Fuel Research Station at Greenwich to a private company; and if he could supply information as to the amount of money received by the State from the private company in payment for the investigations conducted by the Fuel Research Board.

Lord E. PERCY replied that if he was right in assuming that Mr. Wheatley referred to the investigation made into low-temperature carbonization processes, he would direct his attention to the statement made by the Parliamentary Secretary of the Board on May 11 last.

Oil Fuel Extraction.

Lord E. PERCY stated, in answer to Mr. Wheatley, that the experiments being carried out at the Fuel Research Station and Richmond, and the large number of similar experiments elsewhere, had proved the technical possibility of extracting oil fuel from coal, but it was obvious that the Government should not express an opinion on the commercial prospects of any process based on these experiments.

Bradford Road (Manchester) Gas Explosion.

Mr. SUTTON, on Nov. 24, asked the Home Secretary if his attention had been drawn to a recent explosion at the Bradford Road Gas-Works of the Manchester Corporation; and if he had considered the necessity for holding a public inquiry into the circumstances connected with such explosion, so as to allay the feelings of insecurity in the minds of the people resident in the vicinity of the works mentioned.

Sir W. JOYNSON-HICKS replied that he had received a report from the Factory Department on the accident referred to in the question, and had decided, in view of the special circumstances of the case, to direct a public inquiry to be held under Section 22 of the Factory Act.

Smoke Abatement.

In answer to Mr. Robert Wilson, Sir K. Ward, on Nov. 24, gave the following statement as to the working of the Smoke Abatement Act:

The Act came into force only on July 1 last. Bye-laws as to the emission of black smoke had been approved for a number of authorities; and some regional advisory committees had been set up. A draft Order extending the Alkali Acts had been prepared and considered with representative bodies, and the statutory inquiry would be held in December.

Gas Mantles.

Mr. HANNON asked, on Thursday of last week, the Minister of Labour whether any information was available as to the number of persons at present employed in the production of gas mantles in this country, as compared with the number employed immediately prior to the imposition of the Safeguarding Duty in December, 1925.

Sir BURTON CHADWICK said he had been asked to reply. From such information as was available, it appeared that the number of persons employed in the British gas mantle industry in the second and third quarters of the present year was about the same as in the corresponding periods of 1925.

NOTICES GIVEN OF BILLS (SESSION 1928) RELATING TO GAS, &c., UNDERTAKINGS.

Notice has been published of the intention to promote in the 1928 Session of Parliament the following Bills containing clauses having reference to gas undertakings.

Barnet District Gas and Water Company.—The Company intend to promote a Bill mainly affecting the water side of their business, but containing provision with regard to high-pressure air blasts in connection with consumption of gas. There are financial and administrative provisions.

Blackpool Corporation.—This is a Bill to secure the extension of the County Borough of Blackpool, and of the limits of the Corporation for the supply of gas and electricity, together with the transfer to them of the gas, electricity, and other undertakings in the added areas, and consequential provisions.

Bournemouth Gas and Water Company.—This Bill relates to both gas and water. The Company are seeking an extension of limits for the supply of gas, together with additional capital and borrowing powers and other financial provisions. There are sections relating to contracts for the purchase of gas and water in bulk, and to other matters affecting the supply of gas.

Dover Gas Company.—This is a Bill having for its objects to convert and consolidate into £1 shares the whole or part of the existing capital of the Company; to authorize the raising of further capital; to empower the Company, with the consent of the Board of Trade, to subscribe towards the capital of another company; to fix a basic price for gas and rate of dividend; to permit of the establishment of co-partnership; and other matters.

Llandudno Urban District Council.—This is an Omnibus Bill, embracing clauses to confer further powers upon the Council in connection with their gas undertaking.

London County Council (General Powers).—Among other matters suggested in this Bill is an extension to the sale of coke in the administrative County of London of the provisions of the Weights and Measures Act, 1889, relating to the sale of coal; and other provisions as to such sale of coke.

Middlesex and Surrey (Thames Bridges, &c.).—The Middlesex County Council and the Surrey County Council are to promote a Bridges Bill, containing a section relating to the prohibition of, and the restriction upon, placing gas and other mains, pipes, or cables in any of the proposed bridges, roads, or works.

Rotherham Corporation.—Among various matters included in this Bill are further provisions as to the Corporation's gas undertaking—one being to secure exemption from liability for failure or inadequacy when due to default of contractors or circumstances beyond the Corporation's control.

South Metropolitan Gas Company.—The Company are desirous of extending their limits of supply so as to include portions of the borough of Wandsworth and the urban district of Mitcham scheduled in the Bill; and they ask for the repeal of the obligations and powers of the Wandsworth, Wimbledon, and Epsom District Gas Company in this area. Financial provisions are also included.

South Suburban Gas Company.—This is a Bill by which the Company aim at the consolidation of their various Acts; the extension and definition of lands which they may use for gas purposes; the redefinition and extension of the limits of supply; agreements for variation of Company's and adjoining companies' limits of supply, and supplies by one company in limits of another company; the determination of the Company's ordinary dividends by new methods; new standard or basic price or prices and rate or rates of dividend on ordinary capital, and minimum rate or rates of dividend; the supply of power gas; and the exemption of the Company from, or the variation of application to them, of the Gas Regulation Act, 1920. There are financial and other provisions relating to the carrying on and management of the undertaking.

Tottenham District Light, Heat, and Power Company.—The main objects of this Bill are to provide for the transfer to the Company of the undertaking of the Waltham and Cheshunt Gas Company; and to provide for the consolidation and conversion of one or more of the several classes of stock and for the raising of further capital.

Windermere District Gas and Water Company.—Provisions relating to both the gas and water branches of the undertaking are contained in this Bill. The establishment of the therm basis of charge and the fixing of a standard price and dividends are sought, as well as further powers in connection with gas and water supply. An increase in the capital and borrowing powers is also desired.

York Town and Blackwater Gas Company.—The Bill of this Company relates to the conversion and consolidation of the capital, additional capital and borrowing powers, and the establishment of co-partnership. It is also sought to confer further powers upon the Company in connection with their gas and electricity undertakings. Change of name of the Company is sought.

LEGAL INTELLIGENCE.

ACTION OVER THE WORKING OF A SMALL TAR PLANT.

McClellan v. Woodall-Duckham Vertical Retort and Oven Construction Company (1920), Ltd.

(*Before Mr.* E. W. Hansell, *K.C., Official Referee.*)

Some time has been occupied in the Official Referee's Court, King's Bench Division, before Mr. E. W. Hansell, K.C., in the hearing of a case the facts of which are sufficiently explained in the judgment.

Mr. T. Eastham, K.C., and Mr. William Gorman appeared for the plaintiff; Mr. D. N. Pritt, K.C., and Mr. Trevor Watson represented the defendants.

Judgment.

The Official Referee: This was an action for damages for breach of warranty of a tar distilling plant supplied by the defendants to the plaintiff and known as a "T.I.C." plant. The plaintiff is a manufacturer of disinfectants sold in liquid and in tabloid forms at Bolton, and the defendants are the inventors and owners of the process which, put shortly, is a process for extracting from tar the oils required by the purchaser of this plant and delivering the residue in the form of pitch. The plaintiff had been in the habit of purchasing the oils he required, but, having read about the "T.I.C." process, thought early in 1925 that he would put down one of the "T.I.C." plants and make his own oil for use in his manufactures, selling the residual pitch. On Feb. 12, 1925, the defendants, in answer to an inquiry, sent the plaintiff a copy of their brochure describing the nature and capability of the plant and process; and after some correspondence the plaintiff sent to the defendants, on March 12, 1925, a 2-gallon tin of the tar of the kind he was using, and known as vertical tar, and a small 10-oz. tin of the oil he had found suitable for his purpose. The defendants, who had a laboratory establishment at Greenford, on March 27, 1925, sent the plaintiff reports dealing with the samples of oil and tar which the plaintiff had sent them, stating in the covering letter that they had been able to produce 43·7 p.ct. of oil suitable for the plaintiff's purpose, and 53·5 p.ct. of pitch of quite normally good quality; the remainder being liquor not in question in this action. The plaintiff was attracted by the reports, and on April 6 the defendants wrote that they would be sending through particulars of a plant suitable for the plaintiff's requirements. Accordingly, on April 28, the defendants wrote to the plaintiff enclosing, as the letter states, tender specification and drawing for a tar plant for the manufacture of oils suitable for disinfectant from coal gas tar. The plaintiff said in evidence that there was also enclosed another copy of the brochure. The defendants failed to show that this was incorrect; and I find as a fact on the evidence that the brochure was enclosed, and that the brochure was part of the contract on the defendants' part. This finding, if correct, disposes of the point made by Mr. Pritt as to the well-known difference in the rights of a plaintiff who can only show a representation made without fraud, and one who can show a failure to fulfil the contract on the defendants' part. Some time elapsed, and on Sept. 3 the plaintiff gave an order orally to Mr. Chadder the defendants' representative and the designer of the plant; and this order he confirmed by letter of Sept. 10. It should be mentioned that this plant was much smaller than any distillation plant designed before or since, so far as the evidence discloses its capacity in tons per 24 hours—being only 6 tons, as against 20 to 25 tons. The process was described in the brochure as one for the continuous distillation of tars and oils. This continuity of working was an essential feature. It was also stated that the plant would work at a minimum capital, operating, and maintenance cost. Originally the tar went first into a preheater, whence it passed into the still, the principal feature of which was that it contained a lead bath. The constituents to be eliminated passed then in the form of vapours into a fractionator, which separated them into fractions—namely, the heavier oils and the lighter oils with some water. The residual pitch passed from the still into a pitch pot. After March 2 the preheater was done away with, and the tar was pumped straight into the still; the preheater being used for water cooling, which was introduced by the defendants. The contract provided in the tender that the plant should be erected within twelve weeks from receipt of order, but the plaintiff had to provide on his premises a bay and a tank for the reception of the pitch; and I find that it was not until Dec. 12 that the premises were ready to receive the plant. Some further delay took place, as the plaintiff had not an erector available. The plant was erected in January and the first week in February, and on Feb. 8 it started. The plant was worked at first, and at the end of the time at all events, by or under the direct superintendence of the defendants, who were represented on the works from time to time by Chadder, the designer, and two men named White and Irvine, of whose competence to manage the plant and to instruct the plaintiff's workmen to work it there can, on the evidence, be no question. For a period between Feb. 16 and 23, the plant was worked by the plaintiff's men without any representative of the defendants being on the spot. The evidence has convinced me that the men were perfectly competent; and I accept their evidence, given very fairly and intelligently, that the failure of the plant to work on and after March 2 was in no way due to any want of skill or attention on their part. As to the period from Feb. 16 to 23, White, who had been in sole charge until, I think it was, Feb. 11, stated that he knew enough to work the plant. In spite of everything, however, including a radical alteration of the plant, frequent breakdowns occurred, culminating on March 31, 1926, in a fire, after which the plaintiff decided (and in my opinion he was fully justified in so doing) to allow the defendants to experiment further with the plant.

The action was commenced on July 16, 1926. The facts appeared in the correspondence; and from a large body of evidence called on both sides, it falls into two classes: (1) That of the men on the spot who were working or trying to work the plant; and (2) that of experts. The conclusions of fact to which I have unhesitatingly come are that the plant, as designed, was unfit for the purpose, and not in accordance with the contract; that the defendants had (as one of their own witnesses, Chadder, admitted) ample opportunities of remedying any defects; that the plant did not produce, and was not capable of producing, oil or pitch of the quality which the defendants contracted it should produce; that there was no neglect or want of skill attributable to the plaintiff or his workmen; that the plaintiff was quite as anxious as the defendants that the experiment should be a success; and that the plant as erected and designed, and as worked under the defendants' superintendence, is useless.

After dealing with the warranties, the Official Referee said: The total price was £559, of which the plaintiff paid £460; and the damages claimed and insisted on at the trial amount to £1213 3s. 3d. (certain other consequential claims originally made having been abandoned), made up of the amount so paid and the costs of preparing the premises for the reception of the plant, with two small further claims of £6 and £12. I find—and it was not seriously disputed—that if the plaintiff is entitled to recover, £1213 3s. 3d. is the proper amount of damages. The Official Referee then made a detailed examination of the evidence.

Judgment is given for the plaintiff on the claim for £1213 3s. 3d., and on the counterclaim, both with costs, to include, as agreed, the costs of taking the shorthand notes and transcript of the speeches of the defendants' Counsel; the £200 in Court to be paid out to the plaintiff's Solicitors.

[Regarding this case, it is well known to our readers, through various papers which have been read before technical organizations, that the universal testimony is that the "T.I.C." plant has on gas-works, and for their purposes, been a great success.—Ed., "G.J."]

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

SPECIAL ORDER.

Wrexham Gas Company.

To empower the Company to raise additional capital; to make provision for a standard price for gas; to provide for a co-partnership scheme; and for other purposes.

INSTITUTION OF CHEMICAL ENGINEERS.

Extract from the Report of the Board of Examiners on the Examination for Associate-Membership, June-July, 1927.

The holding of the second public examination in chemical engineering in this country in June-July of this year, not unlike the first, has revealed features which call for comment.

In preparing the questions, no attempt was made to depart from the standard which was set in the examination of 1926. On the contrary, the questions were designed not only to test the knowledge of the candidates in the matter of fundamentals, but to ascertain their ability to attack some of the ordinary problems with which a chemical engineer is faced. While some of the questions concerned some special aspect of the technology of a particular industry, others invited a decision on aspects relating to the solution of typical chemical engineering problems and the application of fundamental chemical engineering knowledge and economics.

The work of some of the candidates reached a much higher level than in 1926, and ability has been shown in the application of physical-chemical and engineering principles to the solution of given problems. There is still, however, a tendency to ignore the specific points in respect of which information is sought, and for the replies to be of a general or descriptive character and unnecessarily diffuse.

In future examinations it is recommended that questions bearing on the "Outline of Training" should be confined to three written papers, and that the fourth should be assigned to the preparation of a simple working drawing.

The second examination has again revealed that most of the candidates are lacking in a knowledge of heat transfer.

CONTRACTS OPEN.

Main and Service Laying, &c.

The Gas Department of the Birmingham Corporation invite tenders for the laying, &c., of mains and services. [See advert. on p. 636.]

PORTSMOUTH TAKES OVER THE EMSWORTH COMPANY.

Immediate Reduction in Price of Gas.

Following upon the acquisition of the local Company by the Portsmouth Gas Company, the manufacturing plant of the Emsworth Gas and Coke Company was closed down on Nov. 26, and the Portsmouth gas supply extended to the new area. Two miles of 12-in. cast-iron main have been laid between Havant and Emsworth. Accompanied by the Engineer (Mr. T. Carmichael), the Chairman of the Portsmouth Company (Mr. T. H. F. Lapthorn, J.P.) formally turned on the supply to Havant at the Hayling Island Bridge. Subsequently, at the Emsworth Gas-Works, they were met by Mr. G. A. Brookfield, the late Chairman of the Emsworth Company, and Mr. John Lewis, the late Vice-Chairman, who completed the ceremony by closing-down the boosting plant and the outlet valve to the gasholder; and after the last charges had been withdrawn from the retorts by the workmen, there were a few congratulatory speeches.

Mr. T. CARMICHAEL complimented Messrs. Frank Bevis, Ltd., and their own workmen on the way the extension of the mains had been carried out, and said he thought he had convinced the Emsworth Directors that morning that the pressure in Emsworth was now higher than had been previously supplied by the Emsworth Company.

Mr. LAPTHORN stated that the Portsmouth Company were taking over the whole of the Emsworth employees, as promised, and they would be immediately admitted to the Company's pension scheme. With regard to the Emsworth consumers, Mr. Lapthorn pointed out that as the result of the amalgamation the price of gas was reduced on Oct. 1 by 2d. per therm, and two further reductions would be made at intervals of five years. At the end of ten years, the price of gas in Emsworth, though rather higher than in Portsmouth, would be substantially less than the Emsworth Company would have been in a position to charge.

Mr. BROOKFIELD, whose connection with the Emsworth Company has extended over forty years, expressed thanks to the Portsmouth Directors for the manner in which the negotiations had been carried through, and said he felt that the amalgamation was a step in the right direction, and that everybody would benefit.

Mr. JOHN LEWIS mentioned that the Emsworth Company had been carried on for 74 years; but they felt that amalgamation was inevitable, because their own works were no longer adequate to meet the growing needs of the district.

Frost Brings Big Business.—Mr. E. J. Sutcliffe, the Bradford City Gas Engineer and General Manager, reported to the Gas Committee on Nov. 18 that a few days' frost in the previous week had resulted in the sale of over 5 million c.ft. of gas more than in the previous week, and the sale was nearly 4 million c.ft. in excess of the total for the corresponding week of last year.

ORIENTAL GAS COMPANY, LTD.

ANNUAL GENERAL MEETING.

The Annual General Meeting of the Company was held at the London Offices, Finsbury House, Blomfield Street, E.C., on Wednesday, Nov. 23—Mr. STANLEY H. JONES, M.Inst.C.E. (the Chairman), presiding.

The SECRETARY (Mr. S. Rainer) read the notice convening the meeting and the report of the Auditors; and the report of the Directors and the statement of accounts for the financial year ended June 30 last were taken as read.

The CHAIRMAN: The accounts before you to-day cover a period which, as regards the Company's operations, has been uneventful; and I am thankful to say the disturbed industrial conditions in this country brought about by the prolonged coal strike in 1926 did not seriously affect our business in Calcutta, which progressed and increased steadily and satisfactorily in so far as the sale of gas was concerned.

CAPITAL PER MILLION C.FT. AGAIN REDUCED.

Taking the accounts in detail, there has again been no additional charge to capital; all expenditure on extensions and improvements having been debited to revenue account. The capital expended has again been reduced—namely, from £707 per million c.ft. of gas made to £687, or a reduction of £20 per million c.ft. That is a quite favourable figure for an overseas Company like ours. As regards the revenue account, on the expenditure side, coal cost £45,177, as compared with £46,200 in the previous year—a saving of over £1000. Salaries, wages, and purification are slightly more. Repairs and maintenance of works and plant cost more by some £2945. It was necessary to order larger engines and exhausters for our Sealdah Works, to cope with the increasing make of gas; and extensions of our sulphate plant were also undertaken. On the distribution side, salaries and wages are rather less, as is also the item of mains and services. Meter repairs and renewals are down by nearly £1800; but stoves and fittings charges are higher by some £1200. Public lamps expenditure is more by about £640, due to increases in public lighting. Rents, rates, and taxes are higher by nearly £3280; this being in the main accounted for by reason of the Company receiving only one refund of Indian income-tax as compared with a double refund in the previous year. Management charges are less by about £400. Of the other charges on the debit side there are two which call for comment—namely, Law Charges and Passages. In regard to the first, the Company had to defend a law action brought by the Howrah Municipality in regard to the effluent from their Howrah Works. In the result a compromise was effected; but the law costs incurred were, I fear, heavy, owing to the prolonged proceedings. In the second case—Passages—this item is heavier than in the preceding year consequent upon more officers coming home on leave.

INCREASED GAS RENTAL.

On the receipt side of the account, gas rental was higher by £6650. Rentals of meters and stoves were slightly more. Residuals were less by about £3480; the continued fall in the market price of coke being chiefly responsible for this. The total revenue from all sources was £145,773, as compared with £142,395 in the previous year—an increase of £3378. The total expenditure was £121,187, as contrasted with £115,036—an increase of £6151.

The balance of profit was £24,585, as against £27,359 the year before—a decrease of £2774. In the net revenue account, bank interest was £2480, as compared with £3026—a decrease of £546. Profit on exchange was £6112, as against £6417—a decrease of £305. The balance available for dividend purposes is £60,889; and the Directors recommend the same final dividend as last year—namely, 4½ p.ct.—making, with the interim dividend of 3½ p.ct. already paid, 8 p.ct., less tax, for the year. There is no change in the next four items of the accounts—namely, the reserve fund, &c.

TOTAL GAS SALES AND QUANTITY MADE PER TON UP.

With regard to the statements of coal and residual products, 48,068 tons of coal were carbonized, as compared with 47,623 tons in the previous year. The gas sold was 537,166,300 c.ft., as compared with 503,989,500 c.ft.—an increase of 6½ p.ct. This, I think, is very satisfactory. With regard to the residual products, the combined quantity of coke and breeze produced was rather less than before, as was also the quantity of tar. The amount of sulphate was slightly more. Turning to the balance-sheet, cash at bankers was at the end of the year £4499, as against £4086. Investments are the same. The loan from the bank was £40,430, as compared with £49,285—a substantial reduction of £8855. Now as to matters which the accounts do not deal with. Our Manager, Mr. Snelgrove, in his annual report to the Directors, states that the quantity of gas sold per ton of coal carbonized was the highest yet recorded for Calcutta—namely, 11,204 c.ft. This is very creditable to all concerned. There was a net increase of 910 in the number of stoves,

geysers, gas heaters, and other appliances fitted on our district, and 104 lamps on private consumers' premises.

AMICABLE RELATIONS.

Mr. Snelgrove certifies that the Company's property, buildings, plant, and distributing system are in thoroughly good and serviceable condition. He states that there have been no labour difficulties, and that relations between the various public bodies and the Company have been most amicable. This is very gratifying. He pays a tribute to the good work of his staff. This is all satisfactory reading, and, I hope, of good augury for the future. I am pleased to say the Board have had the opportunity of seeing three members of the staff this year at home, one of whom, our Assistant Manager, Mr. Garsed, attended several meetings of the Board, and was able, on Mr. Snelgrove's behalf, to give the Directors much interesting information as to the progress of our business in Calcutta. Town planning schemes are going on there, as here; and they will want us to go into these districts, which is very promising.

SATISFACTORY RESULTS.

Now, gentlemen, I will conclude my remarks by saying how pleasant a duty it is to be able to again present accounts which enable the Directors to recommend to you the usual dividend; and I think you will agree that our best thanks are due to Mr. Snelgrove and those working with him for the successful results attained, and also to Mr. Rainer and our London staff for the efficient manner in which they present the accounts to us. I now beg to propose the adoption of the report and accounts, and will ask Mr. Ellis to second the resolution, after which I shall be pleased to deal with any questions there may be.

Mr. BERTRAM W. ELLIS, Assoc.M.Inst.C.E., seconded the motion; and it was unanimously adopted without discussion.

DIVIDEND AND RE-ELECTIONS.

On the proposition of Mr. BASIL M. GILL, seconded by Mr. WILLIAM G. BRADSHAW, C.B.E., it was resolved:

> "That a dividend of 8 p.ct., less income-tax, be declared for the twelve months ended June 30, 1927, and that the same be paid to the proprietors on Nov. 24, less 3½ p.ct. paid on account on May 31 last."

Mr. BRADSHAW proposed the re-election as Directors of Messrs. B. W. Ellis and B. M. Gill. He said he had the greatest possible confidence in doing so, for he had had experience of the care and industry which both these gentlemen brought to bear upon the business of the Company, and of the knowledge and skill which they displayed in their work.

The CHAIRMAN heartily endorsed these remarks in seconding the resolution, which was agreed to.

The Auditors (Messrs. S. W. Savage and F. J. Bradfield) were re-appointed, on the motion of Mr. E. CLARK, seconded by Mr. H. W. MITCHELL.

VOTES OF THANKS.

Mr. ELLIS, proposing a hearty vote of thanks to the staff in Calcutta and London for their work during the year under review, remarked that the Chairman had told them that Mr. Snelgrove, the General Manager, had acknowledged handsomely in his report the assistance which he had received during the year from his staff in Calcutta; and if the proprietors would bear with him, he would like to name them individually, as acquaintanceship with their names would bring the shareholders and the staff a little closer together. In the first place, there was Mr. Snelgrove, who unfortunately had been rather ill lately, and was away on a short holiday when they last heard from him. The Directors hoped, however, that he would soon be restored to health. The conduct of the Company's business in Calcutta did not grow any easier as the years went by. Relationships between everybody—labour included—were more complicated now than in past times; and it reflected the greatest credit upon Mr. Snelgrove and his assistants that they should have handled the Company's affairs and protected their interests in the way they had done. Mr. Garsed, the Chief Assistant Manager, had been over this year on leave, as had also Mr. Morrison, the head of the Meter Department, and Mr. Bathgate. As was the practice of members of the staff when over here, they had brought themselves right up-to-date in matters affecting their respective departments, and had gone back to give the Company the benefit of any additional knowledge which they might in this way have acquired. Mr. Smith, the Works Manager, had had his hands very full. The Chairman had spoken of the erection of new exhausters; and there had also been replacements of retort house plant, and other things which were continuing into this year. He was still busy. Mr. Bacon, the Chief Superintendent of Mains, had unfortunately been somewhat ill, but he was glad to say was now much better. The practical result of his work was shown in the further reduction in the unaccounted-for gas, which had now been brought down to below 13 p.ct. This was very creditable to the Company, who had a long mileage of main and a small consumption per mile. There were also Messrs. Savage and Carlisle, who shared in the appreciation expressed by Mr. Snelgrove in his report. As regarded the London staff, he could say no more about Mr. Rainer and his assistants than that they had fully maintained their high standard of work and fidelity to the interests of the Company.

Mr. GILL seconded the vote, which was heartily accorded, and briefly acknowledged by Mr. RAINER.

Mr. F. J. BRADFIELD proposed a vote of thanks to the Chairman and Directors for their administration of the Company's affairs. In his (Mr. Bradfield's) position of Auditor, he had, of course, opportunities of watching closely their financial policy; and he would like to say that he approved in its entirety the policy which had been pursued by them for some years past. There were two items to which particular attention might be drawn. The first was the reduction in the capital expended per million c.ft. of gas, and the second was the percentage of unaccounted-for gas. Each year they were told that these items had been further reduced; but he thought the achievements should be brought out clearly, so that it might be seen that these yearly reductions were something to be proud of. He happened to have with him an analysis which he made some years ago. It was got out in 1919. The capital expended then was 23s. 7d. per 1000 c.ft. of gas sold; whereas the amount to-day was 10s. 0½d. only. The quantity of gas unaccounted for in the past year (13 p.ct.), mentioned by Mr. Ellis, compared with 23 p.ct. in 1919. For this the management deserved all credit.

The vote having been seconded, and unanimously passed,

The CHAIRMAN, on behalf of his colleagues and himself, said they were very grateful for this acknowledgment of their services. It was a great pleasure to be able to report such satisfactory results year by year. The accounts for the past year had not been quite so good as those for the previous year, on account of the poor coke market. He could only hope that the future held in store for them meetings as happy as those they had had in the past.

TRADE NOTES.

New Holder for Oswaldtwistle.

The Oswaldtwistle Gas-Works Committee have accepted the tender of Messrs. R. & J. Dempster, Ltd., of Manchester, for the erection of a four-lift spiral-guided gasholder.

"Underjet" Coke Ovens.

Messrs. Simon-Carves, Ltd., of Manchester, have received an order from the Wath Main Colliery Company, Ltd., Wath, near Rotherham, for a battery of "Underjet" coke ovens, with the necessary additional bye-product recovery and treatment plant. Also for additional drainage and storage plant.

Tully-Yeo C.W.G. Plants.

Messrs. Tully, Sons, & Co., Ltd., of Newark-on-Trent, have received an order from the Kettering Gas Company to convert their Tully plant into a carburetted plant under their Tully-Yeo patent, similar to those now in operation at Horley and Littlehampton. This firm have within the last two years erected some sixteen plants in Scotland alone. Their mechanical operator is being added to the plants at Littlehampton and Kettering. These operators have been found to increase the efficiency of the plants by from 10 to 15 p.ct., and have proved a great success.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 28.

There is rather more inquiry for pitch, and the price is firmer at about 90s. per ton f.o.b. makers' works.

Creosote also is firm at not below 9d. per gallon.

Tar spirits are unchanged; pure benzole being 1s. 5d. to 1s. 6d. per gallon; pure toluole about 1s. 10d. to 1s. 11d. per gallon; 95/160 solvent naphtha 1s. 3d. per gallon; and pyridine 6s. to 6s. 6d. per gallon.

Tar Products in the Provinces.

Nov. 28.

There has been little or no alteration in the market for tar products during the past week, and markets generally remain steady.

Pitch is quiet; but the undertone is decidedly firm; and there is very little offering for either prompt or forward delivery.

Creosote oil keeps very firm indeed.

Water-white products are quiet. Carbolic acid remains firm, and cresylic acid is still in good demand.

In pure naphthalene business is reported to have been effected at the advanced prices.

The average prices of gas-works products during the week were: Gas-works tar, 61s. 6d. to 66s. 6d. Pitch—East Coast, 85s. to 86s. f.o.b. West Coast: Manchester, 80s. to 81s.; Liverpool, 83s. to 83s. 6d.; Clyde, 84s. to 85s. Benzole, 90 p.ct. North, 1s. 1d. to 1s. 2d.; crude, 65 p.ct. at 120° C., 10d. to 10½d., naked at makers' works; 50/90 p.ct., naked, North, 1s. 3d. to 1s. 4d. Toluole, naked, North, 1s. 4d. to 1s. 5d. nominal. Coal-tar crude naphtha, in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 9½d. to 10d. Heavy naphtha, North, 10d. to 1s. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7⅜d. to 7½d.; Scotland, 7½d. to 7⅝d. Heavy oils, in bulk, North, 8⅜d. to 9½d. Carbolic acid, 60 p.ct., 2s. 4d. to 2s. 5d. prompt. Naphthalene, £13 to £14; salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

South Metropolitan Price Reduction.—The Directors of the South Metropolitan Gas Company have decided to reduce the price of gas by ½d. to 8⅜d. per therm. The reduction will apply to the meter readings as from the Christmas quarter.

The Cost of a Gale.—The cost of a gale to a gas undertaking in an area of hilly country was indicated in a report given to the Bradford Gas Committee on Nov. 18, when it was stated that, in the gale on the night of Oct. 28, 10 street lamp pillars were blown over, 61 lamp-heads were blown off, and 8857 gas mantles were broken. The damage of the night's gale cost £262 to repair.

Burnley's New Gas-Works.—Gas manufacture has begun at the first section of the new works being erected for the Burnley Corporation; and everything has so far proceeded smoothly. Mr. J. Herbert Clegg (the Manager) states that there has not been the slightest hitch since they commenced experimental production. Considerable work remains to be done before the installation is complete; and then the full output will be 2,650,000 c.ft. a day. This will not be sufficient to replace the old works at Saunder Bank. Up to last year, these works turned out 3,500,000 c.ft.; but the scrapping of some worn-out plant reduced the quantity to 2,000,000 c.ft. Mr. Clegg states that his Committee have instructed him to prepare plans for a second gas-making unit for installation in the spring.

STOCK MARKET REPORT.

MOST of the markets were dull and uninteresting last week, but towards the close Rubber came to the rescue. In the gilt-edged market also there was a better demand; but, as is often the case, dealers were not too well supplied with stocks. One stock that showed marked weakness was the 3½ p.ct. Conversion Loan, which fell to below 75 for a time. New issue competition was more of a factor in the investment market. The lists of the unexpected Australian Commonwealth Loan were not closed until Friday afternoon; and it is expected that the underwriters will be left with a considerable proportion of the issue. Of other recent new issues, the Kenya loan was well supported, one sale being recorded at 3 3/32 premium. The new Brazilian 6½ p.ct. Bonds were also dealt in at 2⅝ premium.

There was decidedly less speculative activity in the Industrial Market, and the movements that did occur were not encouraging. Artificial Silks (excepting Courtaulds) and Gramophones showed a sharp decline.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Ht.Yr	Dividends. Last Ht. Yr.	NAME.	Quotations. Nov. 25.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices.
£			%p.a	% p.a.				
171,975	Stk.	Sept. 8	5	5	Aldershot 5 p.c. max. C. .	68—73	..	70
223,992	,,	,,	4	4	Do. 4 p.c. Pref. . .	67—70	..	..
1,551,863	,,	Sept. 29	7	7	Alliance & Dublin Ord. .	90—94	..	91—91⅝
274,000	,,	July 14	4	4	Do. 4 p.c. Deb. . .	64—67	..	..
592,654	,,	Aug. 25	—	7	Barnet Ord. 7 p.c. . .	103—105	..	104
300,000	1	Oct. 13	1/7½	1/7½	Bombay, Ltd.	21/6—23/6	..	21/6
170,000	10	Aug. 25	8½	8½	Bournemouth 5 p.c. . .	12½—13½	..	..
600,050	10	,,	7	7	Do. B 7 p.c. . .	12—12½	..	
275,000	10	,,	6	6	Do. Pref. 6 p.c. .	10⅞—11⅛	..	10⅞
50,000	Stk.	June 29	3	3	Do. 3 p.c. Deb. .	55—58	..	..
162,025	,,	,,	4	4	Do. 4 p.c. Deb. .	75—78	..	..
867,900	,,	Aug. 25	—	7½	Brighton & Hove 6 p.c. Con.	108—111	..	..
341,800	,,	,,	—	6/8/6⅔	Do. 5 p.c. Con.	96—99	..	..
1,327,800	,,	July 28	5	5	Bristol 5 p.c. max. . . .	87—88a	+¼	..
885,000	,,	Sept 29	7	8	British Ord.	109—112	..	111—111½
100,000	,,	June 29	7	7	Do. 7 p.c. Pref. . .	114—117	..	..
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	74—77	..	..
200,000	,,	,,	—	88/2	Do. 5 p.c. Red. Deb.	95—98	..	96
100,000	10	Nov. 24	8	6	Cape Town, Ltd. . . .	7—8*	−½	..
100,000	10	Oct 27	4½	4½	Do. 4½ p.c. Pref. . .	6—7*	..	..
150,000	Stk.	June 29	4½	4½	Do. 4½ p.c. Deb. . .	70—75	..	..
636,850	,,	July 28	6	6	Cardiff Con. Ord. . . .	100—103	..	..
237,850	,,	June 29	7½	7½	Do. 7½ p.c. Red. Deb. .	103—106	..	..
157,150	,,	Aug. 11	6½	5	Chester 5 p.c. Ord. . . .	87—92b	..	..
79,135	1	Oct. 13	1/2/-	1/2/-	Colombo Ltd. Ord. . . .	28/—30/-	..	..
24,495	1	,,	1/4⅛	1/4⅛	Do. 7 p.c. Pref. .	20/—22/-	..	..
231,490	1	Oct. 13	1/9⅛	1/9⅛	Colonial Gas Assn. Ld. Ord.	24/—26/-	..	..
173,900	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/—22/-	..	..
2,073,280	Stk.	July 14	—	5	Commercial Ord. . . .	92—94	+1	91½—93½
475,000	,,	June 16	3	3	Do 3 p.c. Deb. . .	56—59	..	..
800,000	,,	Sept. 29	‡1	‡1	Continental Union, Ltd. .	30—35	..	30
200,000	,,	,,	7	7	Do. 7 p.c. Pref. . .	87—92	+5	90
727,560	,,	Aug. 11	6½	6½	Croydon sliding scale . .	98—101	..	..
498,100	,,	,,	5	5	Do. max. div. . . .	80—83	..	81½—82½
492,270	,,	Aug. 25	9	6	Derby Con.	103—105e	..	..
55,000	,,	June 29	4	4	Do. Deb.	73—75e	..	..
209,000	,,	Aug. 25	5	5	East Hull Ord. 5 p.c. .	78—81	..	..
50,000	,,	June 16	5	5	Eastbourne 5 p.c. Deb. .	90—95	..	..
1,003,180	10	Sept. 29	†3	†4	European, Ltd.	7⅞—7⅞	+⅛	7⅞—7⅞
8,747,450	Stk.	July 28	5	5	Gas Light & Coke 4 p.c. Ord.	89—91	..	89—89½
2,500,000	,,	,,	3½	3½	Do. 3½ p.c. max. . .	61—63	..	..
4,187,220	,,	,,	4	4	Do. 4 p.c. Con. Pref. .	76—79	..	76½—77
5,628,620	,,	June 16	3	3	Do. 3 p.c. Con. Deb. .	59½—61½	..	60½—61½
181,315	,,	,,	6	6	Do. 6 p.c. Br'tf'd Rd. Db.	102—105	..	..
1,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. .	99—101	..	..
43,060	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb. .	..	..	..
92,500	,,	Aug. 25	6½	6½	Hastings & St L. 5 p.c. Conv	88—91	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	72—75	..	..
70,000	10	Oct. 13	†10	†10	Hongkong & China, Ltd. .	18—18	..	..
173,200	Stk.	Aug. 25	5	5	Hornsey Con. 3½ p.c. . .	73—76	+3	..
1,976,000	,,	Nov. 10	10	10	Imperial Continental Cap.	140—143	..	140—141½
223,130	,,	Aug. 11	3½	3½	Do. 3½ p.c. Red. Deb.	68—70	..	..
285,242	,,	Aug. 11	6½	7	Lea Bridge 6 p.c. Ord. . .	94—97	..	..
2,145,907	,,	Aug. 11	5½	5½	Liverpool 5 p.c. Ord. . .	87½—88½b	..	..
600,000	,,	Sept. 29	7	7	Do. 7 p.c. Red. Pref.	101—103b	..	..
165,786	,,	Aug. 25	8	9	Maidstone 5 p.c. Cap. . .	107—112	..	..
75,000	5	June 16	†7	†8	Malta & Mediterranean . .	5½—5⅝	..	5½
541,920	Stk.	Nov. 24	†7	†6	Montevideo, Ltd. . . .	89—91*	−2	..
2,061,815	,,	July 28	5	5	Newcastle & Gateshead Con.	75—75½d	..	..
360,229	,,	,,	4	4	Do. 4 p.c. Pref. .	67½—69½d	..	..
691,705	,,	June 29	8½	8½	Do. 8½ p.c. Deb. .	66½—67½d	..	..
131,785	,,	Aug. 25	—	6/18/0	North Middlesex 6 p.c. Con.	93—96	..	..
900,000	,,	Nov. 24	7	9	Oriental, Ltd.	100—103*	−½	101½—105
188,120	,,	June 29	7⅞	7⅞	Plym'th & Ston'house 5 p.c.	105—110	..	..
414,500	,,	Aug. 25	7½	7½	Portsm'th Con. Stk. 4 p.c. Std.	102—105	..	..
236,782	,,	,,	5	5	Do. 5 p.c. max.	76—79	..	..
2,289,909	1	—	—	—	Primitiva Ord.	20/8—21/3	—/6	20/6—21/6
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb. . .	84—86	..	85½—86
800,000	Stk.	July 28	4	4	Do. 4 p.c. Red. Deb. 1911	72—74	..	73—73½
434,958	,,	June 29	—	4	Do. 4 p.c. Cons. Deb. . .	72—74	..	73—73½
150,000	10	Sept. 29	6	6	San Paulo 6 p.c. Pref. . .	7⅞—8½	..	..
125,000	50	June 29	5	5	Do. 5 p.c. Red. Deb.	47—49	..	..
270,000	Stk.	Sept. 8	5⅔	5⅔	Sheffield A	102—104e	..	..
419,968	,,	,,	5⅔	5⅔	Do. B	102—104e	..	..
1,047,000	,,	,,	5⅔	5⅔	Do. C	102—104e	..	..
90,000	10	May 26	4	6	South African	4—6	..	..
4,609,895	Stk.	Aug. 11	7	5	South Met. Ord.	102—104	..	102½—103½
500,000	,,	—	—	—	Do. 6 p.c. Irred. Pf.	110—113	..	..
1,895,445	,,	July 14	3	3	Do. 3 p.c. Deb. . .	58—61	..	60
784,000	,,	Sept. 8	6½	6½	Do. 6½ p.c. Red. Db.	102—104	..	102½—103
91,500	,,	Aug. 11	8½	8½	South Shields Con. . . .	101—103d	..	..
1,343,795	,,	July 28	6½	6½	South Suburban Ord. 5 p.c.	102—105	..	103½—105
868,887	,,	June 16	5	5	Do. 5 p.c. Deb.	98—96	..	..
647,740	,,	Sept. 8	5	5	South'mpton Ord. 5 p.c. max.	75—78	..	..
121,275	,,	June 29	4	4	Do. 4 p.c. Deb.	73—76	..	..
260,000	,,	Aug. 25	7	7	Swansea 7 p.c. Red. Pref. .	103—106	..	..
200,000	,,	June 16	6½	6½	Do. 6½ p.c. Red. Deb.	100—103	..	..
120,000	,,	July 28	7⅛	7⅛	Tottenham District A 5 p.c.	105—108	..	108
882,275	,,	,,	6½	6½	Do. B 3½ p.c.	89—92	..	90—90½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	95—98	..	..
191,256	,,	June 16	4	4	Do. 4 p.c. Deb.	72—75	..	..
258,251	,,	Sept. 29	5	5	Tynemouth Con. and New Uxbridge, Maidenhead, &	81—83d	..	..
299,094	,,	Aug. 25	6½	6½	Wycombe 5 p.c. . . .	85—90	..	..
88,880	,,	,,	5	5	Do. 5 p.c. pref. .	88—88	..	85½
80,000	,,	July 14	8½	8½	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c. .	125—130	..	..
355,686	,,	,,	7	7	Do. B 3½ p.c. .	105—110	..	..
482,585	,,	,,	5/19/0	5/19/0	Do. C and New	90—95	..	92
362,000	,,	,,	6⅔	6⅔	Do. Wimbledon 5 p.c. .	100—105	..	..
98,000	,,	,,	7½	7½	Do. Epsom 5 p.c. . .	107—112	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref . . .	85—90	..	..
88,416	,,	June 29	8	8	Do. 8 p.c. Deb. . . .	56—59	..	58
284,745	,,	,,	4	4	Do. 4 p.c. Deb. . . .	74—77	..	..

Quotations a :—a.—Bristol. b.—Liverpool. c.—Nottingham. d.—Newcastle e.—Sheffield. * Ex. div.
† Paid free of income-tax. ‡ For year.

The Gas Market was quite up to expectation. Other than *ex* div. reductions, the only fall was a sixpence in the Primitiva shares. There was a sensational rise of 5 points in the Continental Union 7 p.ct. preference stock to 87-92, and the Hornsey consolidated stock rose 3 points to 73-76. The Commercial ordinary continues to creep up slowly but surely, and now shows nearly 20 points increase on the quotation a year ago. Attention is drawn to the article on the Sheffield Gas Company under the heading of "Potential Investments" appearing elsewhere in these pages. It is hoped that investors will find these articles useful for reference.

The following transactions were recorded during the week:

On Monday, British 111⅜, Commercial 91½, Gas Light and Coke 89⅛, 89½, 3 p.ct. debenture 60½, Imperial Continental 140, Primitiva 20s. 9d., 21s., 21s. 3¼d., 21s. 4½d., 21s. 6d., South Metropolitan 102⅛, 102⅜, 3 p.ct. debenture 60, 6½ p.ct. debenture 102½, 103, South Suburban 5 p.ct. 105, Tottenham "A" 108, "B" 90, 90½, Wandsworth "C" 92. Supplementary prices, Exeter 5 p.ct. debenture 97, Malta and Mediterranean Second 7½ p.ct. preference 5.

On Tuesday, Aldershot 4 p.ct. preference 70, Alliance and Dublin 91½, Commercial 93, Continental Union 30, European 7⅛, 7¼, 7⅜, 7⅝, 7 11/16, Gas Light and Coke 89½, 89¾, 89⅝, 89⅞, 4 p.ct. preference 76½, 3 p.ct. debenture 61½, Imperial Continental 140, 140½, 141, Primitiva 21s., 21s. 1½d., 21s. 4½d., 21s. 6d., South Metropolitan 103½, 3 p.ct. debenture 60. Supplementary prices, Danish 7⅞, Herne Bay 6½ p.ct. preference 5¼.

On Wednesday, Barnet 7 p.ct. maximum 104, Bombay 21s. 6d., British 5 p.ct. debenture 96, Continental Union 30, European 7½, 7⅝, Gas Light and Coke 89½, 3 p.ct. debenture 61, Imperial Continental 141½, Malta 5 5/16, Oriental 102½, Primitiva 20s. 10½d., 21s., 21s. 1½d., 21s. 5½d., 21s. 6d., 4 p.ct. first debentures 85⅜, 86, 4 p.ct. consolidated debenture 73, 73½, 4 p.ct. debenture (1911) 73, 73½, South Metropolitan 102½, 102⅞, 103, 6½ p.ct. debenture 103, South Suburban 5 p.ct. 103½. Supplementary prices, Brighton and Hove 6 p.ct. "B" preference 108, 108½, 5 p.ct. debenture 94, Hartlepool 5 p.ct. maximum 82½.

On Thursday, Alliance and Dublin 91, Bournemouth 6 p.ct. preference 10⅞, Commercial 92½, 93½, Continental Union 7 p.ct. preference 90, Croydon maximum dividend 81⅜, European 7⅝, Gas Light and Coke 89⅛, 89¼, 89½, 89⅝, 89⅜, 3 p.ct. debenture 60½, Imperial Continental 140½, 141½, Primitiva 20s. 6d., 20s. 7½d., 20s. 9d., 20s. 10½d., 21s., South Metropolitan 103, 103¼, 103⅜, Uxbridge 5 p.ct. preference 85½, Wandsworth 3 p.ct. debenture 58. Supplementary prices, Eastbourne 3½ p.ct. "B" 104⅜, Newport (Mon.) 5 p.ct. Rochester, Chatham, 80⅜, 81½.

On Friday, Alliance and Dublin 91⅜, Bristol 85½, British 111, 111 1/16, Commercial 92½, Croydon maximum dividend 82½, European 7⅞, Gas Light and Coke 89, 89¼, 89⅜, 4 p.ct. preference 77, Imperial Continental 140, 140½, Oriental 101⅛, 105, Primitiva 20s. 11d., 20s. 6d., 21s., South Metropolitan 102½, 102⅝, 102⅞, 103, 103¼. Supplementary prices, Brighton and Hove 5 p.ct. debenture 96½.

Money was fairly plentiful in Lombard Street on Friday. For renewing old day-to-day loans, 3½ p.ct. was the general rate; while fresh money rates, commencing at 3½ p.ct., finally dropped to 3¼ p.ct. Treasury Bill allotments averaged £4 5s. 11·97d. p.ct., being just over 8d. p.ct. below the previous week's rate. The variation caused no change in the Discount rates.

In the Foreign Exchange Market, New York was a persistent seller of dollars, and the Sterling rate rose to the new record of 4.88, finishing at 4.87 3/16. French francs were steady at 124.02½; Italian lire improved slightly to 89.60; Spanish pesetas were decidedly weaker at 29.02; the Dutch exchange also moved in favour of this country to 12.07⅝; and Belgas were quoted at 34.93.

Silver rose sharply on Indian support to 26⅜d. per oz.; and with no Gold available, the price rose ½d. to 84s. 11½d. per oz.

The Bank Rate is 4½ p.ct., to which it was reduced from 5 p.ct. on April 21. The Banks' deposit rate is 2½ p.ct., and the deposit rates of the discount houses are 2½ p.ct. at call and 2⅝ p.ct. at notice.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

A quiet week has been passed, without special feature, but characterized by steadiness on the whole. Northumberland steams have been slightly better, and there has been renewed inquiry for coking coals in the Durham section. Gas coals have been fairly well taken, and bookings for December have been satisfactory. As regards next year, there is at present no expansion of business in any direction, export contracts being able to make little headway in the face of the low price indications for foreign coals.

Wear Special gas makes are quoted at 16s. to 16s. 3d. f.o.b., and best qualities at 15s. 9d. Seconds are nominally 13s. 9d. to 14s. Durham unscreened coking is 13s. 6d. to 14s., with a distinct revival in the demand during the past week. Best Durham bunkers are generally well booked, and ask 15s., while seconds are variable at 13s. 6d. to 14s. Northumberland steams have been in better request, and best screened sorts are firmer at 13s. 9d. to 14s.; quite a lot of orders having been booked for December shipment. Gas coke is in good demand and well taken, and the quotation remains firm at 24s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

Gas coals in Yorkshire and Lancashire are moving more freely with the shorter and darker days, and there are a few small inquiries for forward delivery; but they are not of much tonnage. Prices will rule slightly below those operating during the summer.

The general industrial position does not improve, although some of the larger pits are endeavouring to raise the standard price for washed coals, which have been available by necessity at low figures during the last six or nine months. With no sign of improvement among the larger consuming industries, it is problematical whether higher figures can be obtained, although these are said to be vital in many instances if the growing losses at collieries by reason of unremunerative prices and reduced working hours are to be brought down. The export market does not brighten; and if the foreign competitors can continue to place their coals on the market at present rates, the situation, it is declared, will become quite hopeless.

There has been a better demand for domestic fuel during the past week, but nothing of such moment as to influence the market. Collieries generally have sufficient fuel available even with short working hours. Only a long spell of very cold weather can alter the situation.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports: South Yorkshire—Hards, Association, 16s. 6d. to 16s. 9d.; screened gas coal, 16s. to 17s.; washed trebles, 16s. 6d. to 17s.; washed doubles, 15s. 6d. to 16s.; washed singles, 15s. to 15s. 3d.; washed smalls, 10s. 3d. to 10s. 9d.; rough slack, 8s. 6d. to 8s. 9d.; smithy peas, 17s. to 18s. per ton. West Yorkshire—Hartley's (f.o.b. Goole), 14s. 6d. to 15s. 6d.; screened gas coal, 14s. 6d. to 15s. 6d. washed trebles, 16s. 6d. to 17s.; washed doubles, 15s. to 15s. 3d.; washed singles, 14s. 9d. to 15s.; washed smalls, 10s. to 10s. 6d.; unwashed trebles, 15s. 3d. to 15s. 9d.; unwashed doubles, 11s. 6d. to 12s.; rough slack, 9s. to 9s. 3d.; coking smalls, 8s. 9d. to 9s. per ton. Derbyshire and Nottinghamshire—Top hards, 16s. to 18s.; washed doubles, 15s. to 15s. 6d.; washed singles, 14s. 9d. to 15s.; washed smalls, 10s. to 10s. 6d.; unwashed doubles, 12s. to 12s. 6d.; rough slack, 8s. 9d. to 9s. per ton. Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, 14s. 6d. to 15s.; gas coke, 25s. to 25s. 6d.; furnace coke, 17s. to 18s. per ton.

The Lancashire market is very quiet, and prices are easy. Quotations are: Lancashire best house, 31s. to 32s.; seconds, 25s. to 26s.; common, 19s. to 20s.; kitchen, 24s. to 25s.; Yorkshire best selected, 32s. to 33s.; best house, 29s. to 30s.; seconds 19s. to 20s.; washed doubles, 13s. to 14s. 6d.; washed singles, 8s. to 9s.; rough slacks, 7s. 6d. to 8s. 6d. per ton in wagons at pit.

MIDLANDS.

Old members of the trade agree that the present market stagnation is worse than anything in their previous experience. Apart from the regular contract services, which do not keep the pits employed more than half the week, market transactions relate almost entirely to spot lots.

Bids are being invited for practically every description of fuel. Enormous tonnages of gas coal are awaiting absorption. Offers substantially below the contract rates would not be refused. Gas undertakings, like other big consumers, have taken such ample precautions against any interruption of output that they have no room to squeeze in more coal. The electricity undertakings are in the same position, though the difference between present collapsed prices and those which they are paying would represent a great saving on production costs.

Neither in the domestic nor in the industrial market is there any possibility of getting rid of the superflux at a rate materially to facilitate operations at the pits. Merchants who put down heavy stocks at the low prices ruling in summer now find that they could replace them at appreciably lower prices. So that they have stood out of their capital and incurred losses on deterioration and storage for less than nothing.

The plight of the cokeries is serious. Curtailment of production has not brought supply and demand into balance, and spot lots of hard furnace cokes are obtainable at prices almost unheard of at this period of the year.

Hartlepool Gas and Water Stock Issue.—Mr. E. J. Clarke will sell by auction at the Grand Hotel, West Hartlepool, at 3 p.m., on Tuesday, Dec. 6, £60,000 of 5 p.ct. maximum ordinary stock of the Hartlepool Gas and Water Company. In the past sixteen years there has been an increase of 32 p.ct. in water revenue, and of 40 p.ct. in the quantity of gas sold.

Charges for Industrial Purposes at Rugeley.—The Rugeley Gas Company give notice that, from the next reading of the meters, gas consumed on one premises for power or manufacturing purposes will be charged: Under 120 therms, 12d. per therm; 120 and under 240 therms, 10½d.; 240 and under 480 therms, 9½d.; 480 therms and upwards, 8½d.

Bognor Gas and Electricity Company.—The Directors of this Company have authorized Messrs. A. & W. Richards to offer for sale by tender £20,000 new consolidated stock; the minimum price of issue being par. The capital is required to pay for extensions of the Company's plant rendered necessary by the increasing demands for gas and electricity.

Cooker Payment Periods.—The Swadlincote Gas Committee have decided that the purchase period for cookers sold on the ordinary hire-purchase system should be extended from three to five years; the quarterly payments being reduced accordingly. It was also agreed that consumers by slot meter shall be allowed the alternative of paying the purchase price by a small addition to the rate paid for gas.

Lecture at Smethwick.—The second of a series of lectures to the employees of the distribution section of the Smethwick Gas Department staff was held on Wednesday, Nov. 16, at the Municipal Technical College—the Chairman of the Gas Committee (Alderman C. W. Pinkney, J.P.) presiding. The lecturer, Mr. George Sawyer, of Messrs. William Sugg & Co., Ltd., gave an interesting and instructive address on "Gas and Gas Lighting, Photometry, Radiation, Construction of Burners, and the Hygienic Aspect of Gas;" and the able manner in which he dealt with the subject was commented upon by several speakers in the discussion which followed. A vote of thanks to the lecturer was proposed by the Chairman, seconded by Mr. Rudge, and supported by the Engineer and Manager (Mr. E. Hardiker).

New Gasholder for Barnstaple.—Mr. J. F. Ronca (Director of Gas Administration, Board of Trade) attended at the Marine Hotel, Instow, on Nov. 25, for the purpose of holding an inquiry under the Gas Regulation Act into an application by the Barnstaple Gas Company for authority to erect a gasholder on land near the Rectory at Instow. As no objectors were either present or represented, the Inspector announced that the matter resolved itself into one merely of the suitability of the site, which he proceeded to view, accompanied by Messrs. F. W. Hunt, J.P., C.C., and F. L. Schofield, Chairman and Secretary-Manager respectively of the Barnstaple Gas Company, Mr. John F. Bowden (agent), and Mr. H. Battersbury, representing the Tapeley Estate, to which most of the land in Instow belongs.

Electric Lighting Failure.—At last Tuesday week's meeting of the London County Council, replying to Mr. J. D. Gilbert, Mr. C. W. Matthews (Chairman of the Highways Committee) stated that the stoppage of current from the generating station supplying sections of the Embankment and Westminster Bridge caused a failure of the electric lighting on the previous Friday and Sunday evenings. The lights failed for two hours. The Victoria Embankment and Westminster and Waterloo Bridges were lit by electricity; the lighting being divided into sections supplied by different companies. A failure of the supply of current had been extremely rare in the past; and it was not proposed to duplicate the supply over each section. In reply to a further question, Mr. Matthews said that the Company involved was the London Electric Supply.

Yeadon Gas Exhibition.—A gas appliance exhibition, with cookery and other demonstrations, was opened at the Lecture Hall, Yeadon, on Nov. 17, by Mr. W. M. Mason, Manager of the British Commercial Gas Association. The exhibition was promoted by the Yeadon and Guiseley Gas Company; and Mr. Thos. Parsons, of Yeadon, presided. Mr. Mason spoke of the benefits of modern gas heating, cooking, and lighting, and described gas in the home as the "housewife's third hand." Mr. E. H. Hudson, of the Normanton Gas Company, in proposing thanks to the opener and to the Chairman, remarked on the great progress made in the gas industry in over a century of service. Following the opening of the exhibition, a demonstration of cookery by gas was given by Mrs. Margaret Trainer; and similar demonstrations were given afternoon and evening during the period of the exhibition to Nov. 26.

Proposed Extensions at Bradford.—The Bradford Corporation Gas Committee gave preliminary consideration, on Nov. 18, to a scheme submitted by the City Gas Engineer (Mr. E. J. Sutcliffe) for extensions of the Birkshall Gas-Works at an estimated cost of about £20,000, for which borrowing powers will have to be obtained. The Birkshall Works at present have carbonizing plant of a capacity of 7 million c.ft. per day, but the capacity of the purifying plant is only 4,500,000 c.ft. The scheme is to bring the purifying plant up to the producing capacity, and to add other improvements. It is proposed to put the Birkshall plant in such a condition that it could, in conjunction with the Thornton Road Works, for a limited period meet the whole of the requirements of the Department's supply area, while the large Valley Road Works, which in some respects are more or less obsolete, were left free for overhauling and reconstruction.

The Leicester Gas Committee are asking permission to expend nearly £100,000 on a new gasholder. Increased consumption has made the present storage capacity insufficient.

A subsidence which broke gas and water mains occurred in Merton Road, a suburban part of Norwich, recently. People in the neighbourhood heard a loud rumbling, and rushed out to find a hole 30 ft. deep. The road is known to have been built on the site of some old lime and gravel workings.

The retorts at the Skipton Urban District Council Gas-Works are often utilized as a cremating agent for the town's dead dogs and cats, but recently the gas undertaking had an exceptional "customer" in this direction in the form of a half-grown lion, which had died from pneumonia while the Bostock and Wombwell menagerie was in the town.

CONTENTS.

EDITORIAL NOTES.

Consolidating Technical Ability in Our Organizations 667
Developing Coal-Selling Organizations . . 668
Continuous Verticals and Int rmittent Chambers 668
Comparisons of Carbonizing Systems . . . 669
Well Done, Sunderland 669
Institution Education Scheme—Manchester Institution President's Badge—Electrification of Rural Areas—Compulsory Trade Union Membership—The Factories Bill—New Spirit in Industry 670
But Caution—National Health Insurance . 671

Personal 671
Obituary 671
Electricity Supply Memoranda 672
The Institution Education Scheme—District Education Committees 673
Forthcoming Engagements 673
Potential Investments IV.—The Newcastle-upon-Tyne and Gateshead Gas Company . 674
The Riddle of an Explosion. By Norton H. Humphrys 674
Midland Juniors at the Parkinson Gas-Stove Works 675
New Showrooms at Sutton 676
The Slag Corrosion Problem—Further Remarks by A. J. Dale, B.Sc., A.I.C. . . . 677
The Pittsburg Gasholder Disaster 677
Scottish Junior Gas Association (Western District)—
Visit to the Clydesdale Iron and Steel Works 678
Coal and Bye-Product Exports 678
London and Southern District Junior Gas Association—
Carbonization in Vertical Retorts. By T. Campbell Finlayson, M.Sc., A.M.I.Chem.E. 679
Institute of Fuel—
Vertical Intermittent Chamber Ovens for Gas Manufacture. By N. J. Bowater, O.B.E., B.Sc., Assoc.M.Inst.C.E. . . 686
North of England Gas Managers' Association—
Institution Education Scheme 690
Gas *v.* Electricity. By C. F. Barrow . . 690
Lectures to Smoke Inspectors 692

CORRESPONDENCE.

Gas Drying 693
Explosions 693
A Vacuum Apparatus for Clearing Gas Pipes 693

PARLIAMENTARY INTELLIGENCE.

House of Lords—
Progress of Bills 693
Special Orders 693
House of Commons—
Progress of Bills 693
Lighting of the Houses of Parliament . 693
Bergius Process 693

LEGAL INTELLIGENCE.

Chalk Fuel, Power Gas, and Bye-Products Corporation—Summonses for Alleged Fraud 694
Geyser Fatality—A Question of Ventilation . 694
A Question of Income-Tax 694

MISCELLANEOUS NEWS.

Gas Exhibition at Dundee 695
Industrial Research—Establishment of Research Council 696
Centenary of Gas Supply at Dalkeith . . . 696
Coal Trade Reports—
North-East Coast 696
Yorkshire and Lancashire 696
Midlands 696
Contracts Open 696
Extensions 696
Current Sales of Gas Products 697
Trade Notes 697
Stock Market Report 699

PARAGRAPHS.

High-Temperature Insulation 671
Gas Oil Imports—Newcastle Gas Company and the Tynemouth Undertaking . . . 675
Peebles Automatic Station Governors . . 692
Old Mine-Shaft Causes Explosion—Derbyshire Gas Amalgamation—"A Bergin Process"—Brown-Coal Gas in Germany . . 697
Eastbourne Co-Partnership and Pension Schemes—Reduction in Price at Devizes—The Dry Gas Carburetter (Parent Syndicate)—Royal Sanitary Institute—Explosion in Leeds Street—Lancaster Gas Quality—Rubber Tubing in Weaving Mills—Damage to Lamp Columns by Motor Vehicles—Gas-Works as Casual Wards—River Pollution through Carelessness—Reduction in Price at Stourbridge—Exhibition at Swadlincote—Reduction in Price at Maidstone—Cheaper Gas in North London—Fatality at the Black Rock (Brighton) Works—Cheaper Gas at Burnley 698

"JOURNAL" OFFICE TELEPHONE.

The "Journal" Office Telephone Number is "Central 6055."

For List of "JOURNAL" Advertisers, *see* p. 702.

GREATER TUBE SERVICE

Note the extra long continuous lengths supplied, reducing number of joints required.

Keeping down Costs of Distribution.

Bromford

WELDLESS STEEL GAS MAINS

definitely save distribution costs, because—

The All-Steel Main is lighter—more economical—ensuring better service than cast iron.

Fewer joints required owing to the longer lengths provided.

Less risk of fracture, consequently the Steel Main can be laid nearer the surface.

Easy bending on site, avoiding ordering of "Specials."

A big saving from leakages, because there are fewer joints: Steel is practically unbreakable and therefore leakproof.

Send us your Enquiries.

'Phone: East 696-697.

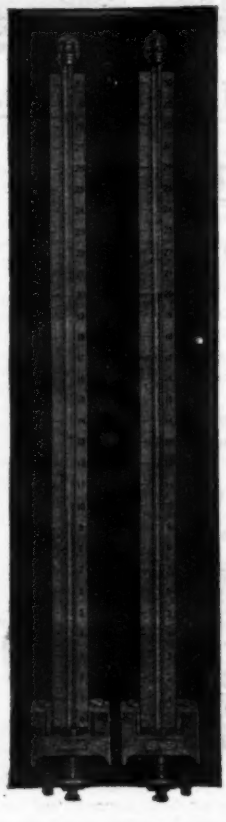
'Grams: Tubular, Birmingham."

FOR
EFFICIENCY
DURABILITY
QUALITY &
ACCURACY

ORIGINAL
DRY GAS METER MAKERS
ESTABLISHED
IN 1844.

THOMAS GLOVER
ESTD & CO LTD 1844
GOTHIC WORKS, EDMONTON, LONDON. N.18.,

BRANCHES AT: BELFAST,
BIRMINGHAM, BRISTOL, DUBLIN,
EDINBURGH, GLASGOW, MANCHESTER
& NEWCASTLE-ON-TYNE



PARKINSON'S

SINGLE TUBE GAUGES

One Pattern, Interchangeable.
Pressure, Vacuum, Differential.
Scale starts from
ZERO
Inches of Water
Inches of Mercury
lbs. per sq. in.

W. PARKINSON & CO.,
INCORPORATED IN PARKINSON & COWAN (GAS METERS), LTD.

COTTAGE LANE, CITY ROAD, LONDON, E.C.1.
Telegrams: "INDEX, ISLING, LONDON."
Phone Nos.: 4970 Clerkenwell

BELL BARN ROAD, BIRMINGHAM.
"GASMETERS, B'HAM."
2345 Midland, B'ham.

MORNINGTON STREET ORMEAU ROAD, BELFAST.
"PREPAYMENT, BELFAST."
3874 Belfast.